Permit Fact Sheet

General Information

Permit Number	**WI-0036820-05-0**
Permittee Name and Address	**MILWAUKEE METRO SEW DIST COMBINED** **260 West Seeboth St, Milwaukee WI 53204**
Permitted Facility Name, Address and Discharge Location	**Outfall 001 SOUTH SHORE** - Lake Michigan via discharge pipe 1,927 feet east of the facility located at 8500 S. Fifth Ave., Oak Creek, WI. **Outfall 002 JONES ISLAND** -Milwaukee Outer Harbor via an outfall pipe at the sheet pile wall directly east of the disinfection tank of the facility located at 700 East Jones St., Milwaukee, WI
Permit Term	October 1, 2026 to September 30, 2031
Receiving Waters	Lake Michigan, Great Lakes Basin in Milwaukee County Milwaukee Outer Harbor, Milwaukee River Basin/Great Lakes Basin in Milwaukee County Milwaukee Inner Harbor/Kinnickinnic River, Milwaukee River Basin in Milwaukee County
Stream Flow ($Q_{7,10}$)	**Lake Michigan –** A ten-to-one (receiving water-to-effluent) dilution ratio is used for calculating effluent limits based on chronic or long-term impacts, in accordance with s. NR 106.06(4)(b)2, Wis. Adm. Code. **Milwaukee Outer Harbor** - A four-to-one (receiving water-to-effluent) dilution ratio is used for calculating effluent limits based on chronic or long-term impacts, in accordance with s. NR 106.06(4)(b)2, Wis. Adm. Code because the receiving water does not exhibit a unidirectional flow at the point of discharge. This dilution ratio was determined as a result of a previous mixing zone study submitted by MMSD.
Stream Classification	**Lake Michigan –** Cold Water (1), Public Water Supply **Milwaukee Outer Harbor** - Cold Water (1), Public Water Supply, the Milwaukee River mainstem is a warm water system, but the outer harbor is transitional and highly influenced by both Lake Michigan and the inner harbors tributary flows.
Discharge Type	Existing, Continuous

Design Flow(s)		**South Shore**	**Jones Island**
	Daily Maximum	265 MGD	310 MGD
	Weekly Maximum	190 MGD	190 MGD
	Monthly Maximum	170 MGD	164 MGD
	Annual Average	113 MGD	123 MGD

Industrial Commercial Contributors	As a control authority, Milwaukee Metropolitan Sewerage District (MMSD) regulates 129 significant industrial users
Plant Classification	Advanced: A1 – Biological Treatment Suspended Growth; B – Solids Separation; C – Biological Sludge Treatment, Handling, and Disposal; P – Nutrient Removal Total Phosphorus; D – Disinfection; L – Laboratory; and SS – Sanitary Sewage Collection System.

Approved Pretreatment Program?	Yes. December 28th, 1983

Facility Description

The Milwaukee Metropolitan Sewerage District is a state chartered, government agency providing wastewater treatment services for 28 municipalities and 1.1 million people. The District's service area includes all cities and villages, (except the City of South Milwaukee), within Milwaukee County and all or part of 10 municipalities in the surrounding counties of Ozaukee, Washington, Waukesha and Racine. Approximately 3,000 miles of community-owned sewers lead to a 310-mile system of intercepting sewers that convey sewage to the Jones Island and South Shore water reclamation facilities (WRFs). Both WRFs provide secondary treatment of residential, commercial and industrial wastewater. See descriptions for Outfall 001, 002, and 003 below. Approximately 7% of the total sewer service area has combined sewers which serve portions of the City of Milwaukee and the Village of Shorewood. As a result, tributary flows can exceed 1 billion gallons per day during major storm events. Therefore, an Inline Storage System (ISS) or "deep tunnel" is used to store excess volumes and reduce the risk of combined and sanitary sewer overflows. The deep tunnel was originally completed in 1993 and was later expanded in 2005 and 2010 to the present storage capacity of 521 million gallons. The system enables the District to collect, store and convey the increased sewage volumes associated with storm events to either or both WRFs.

Outfall 001 - South Shore Water Reclamation Facility (SSWRF) is located approximately 10 miles south of the Jones Island Water Reclamation Facility, along the Lake Michigan shore in Oak Creek. At SSWRF, the liquid wastes treatment train consists of fine screening, grit removal, primary clarification, activated sludge aeration, secondary clarification, chlorination and dechlorination. Iron (ferric chloride, ferrous chloride, or ferrous sulfate) is added between preliminary and primary treatment for chemical phosphorus removal. Effluent is discharged through a 4-port diffuser located 1,200 feet east from the north end of the facility into Lake Michigan. Anaerobic sludge digestion produces methane gas and fuels large generators which produce over half of the electricity needed for SSWRF's treatment processes.

Outfall 002 - Jones Island Water Reclamation Facility (JIWRF) is located in the center of the sewer service area in the Milwaukee Harbor. At JIWRF, the liquid waste treatment train consists of fine screening, grit removal, primary clarification, incidental biological phosphorus removal, ferric addition as a polish, activated sludge aeration, secondary clarification, chlorination and dechlorination. Effluent is discharged through Outfall 002 at the northeast corner of Jones Island to the Milwaukee Outer Harbor on Lake Michigan.

Outfall 003 - The current permit includes Outfall 003 which contains noncontact cooling water (NCCW) from Jones Island. Since January 2023, the NCCW has been rerouted to preliminary treatment with no unique surface water discharge, so this outfall has been inactivated.

Biosolids - Nearly all solids from the treatment process are dried and made into Class A exceptional quality sludge (Milorganite) at Jones Island, a commercial fertilizer sold throughout the United States and Canada. The remaining solids that are not made into Milorganite are hauled to a sanitary landfill. The Milorganite fertilizer production process includes blending digested primary sludge with secondary sludge, gravity belt thickening, belt filter pressing, drying, and distribution of Class A biosolids. Under most conditions, an interplant solids pipeline system is utilized to optimize solids treatment and efficiency potential between both WRFs. Primary sludge is sent from JIWRF to SSWRF for digestion, and then all digested sludge is returned to JIWRF for processing into a class A, exceptional quality "EQ" biosolids. If needed, SSWRF can utilize plate press thickening for complete on-site solids handling. This cake production occurs approximately once per year to keep the equipment operational in case of problems at Jones Island.

The following tables identify sampling locations in the MMSD system. 7## numbers indicate an influent sampling point, 00# indicate an effluent sampling point, 1## indicate a sampling point in a WRF or bypass location, and 8## numbers identify groundwater sampling locations.

Substantial Compliance Determination

After a desk top review of all discharge monitoring reports, compliance maintenance annual reports, land application reports, compliance schedule items, and site visits on September 18 and 19, 2024, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Jacob Van Susteren-Wedesky, Wastewater Engineer on November 17, 2025.

Sample Point Designation		
Sample Point Number(s)	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/sample Contents and Treatment Description (as applicable)**
701	94.5 MGD annual average (2019 – 2025)	Jones Island INFLUENT: 24-hr flow proportional composite samples shall be collected prior to coarse screening from the high and low siphons and Inline Storage System (ISS).
702	88.7 MGD annual average (2019 – 2025)	South Shore INFLUENT: 24-hr flow proportional composite samples shall be collected after preliminary treatment (screening and grit removal) and prior to primary treatment.
703	0.80 MGD annual average (2019 – 2025)	Jones Island COOLING WATER INTAKE: Intake flow shall be monitored on days of operation of the Milwaukee Inner Harbor/Kinnickinnic River cooling water intake structure. The cooling water intake is only to be used during blending events when JI is unable to recycle plant effluent for cooling and maintenance purposes.
704	N/A – New Sampling Point	Effluent Pump Station COOLING WATER INTAKE: Intake flow shall be monitored on days of operation of the Lake Michigan cooling water intake structure. The cooling water intake is only to be used during blending events when JI is unable to recycle plant effluent for cooling purposes.
001	87.2 MGD annual average (2019 – 2025)	South Shore EFFLUENT: 24-hr flow proportional composite samples and grab samples shall be collected from the effluent channel adjacent to the effluent pump station after chlorination and dechlorination.
002	103.3 MGD annual average (2019 – 2025)	Jones Island EFFLUENT: 24-hr flow proportional composite samples and grab samples shall be collected from the effluent channel via the sampler located in the effluent pump station after disinfection and prior to discharge.
003	N/A – Outfall Removed	~~Jones Island NONCONTACT COOLING WATER: Grab samples shall be collected from the discharge channel.~~
004	N/A – Sample Point Removed	~~South Shore (Agrilife), Class B, anaerobically digested liquid sludge. Representative samples shall be collected at the digester prior to land application. ***This outfall is currently inactive, and the permittee shall notify the Department prior to use/discharge.***~~
005	1,107 dry US tons	South Shore Class B, anaerobically digested, plate press, centrifuge, or belt filter press thickened cake sludge. Representative samples

Sample Point Designation		
Sample Point Number(s)	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/sample Contents and Treatment Description (as applicable)**
		shall be collected at the cake in storage prior to land application or landfilling.
006	40,000 dry US tons	Jones Island Class A, with anaerobically digested primary solids and sometimes anaerobically digested secondary solids, dewatered, hot gas dried sludge. PRODUCTION. Representative samples shall be collected at the composite sampler after drying and before storage. Sewage sludge particle temperature shall be monitored at each dryer for the heat drying requirement and near the bottom of each recycle bin immediately prior to the bin outlet gates to classification for the time-temperature requirement.
008	40,000 dry US tons – same as 006 due to shipping sampling location of Class A product	Jones Island Class A, with anaerobically digested primary solids and sometimes anaerobically digested secondary solids, dewatered, hot gas dried and stored sludge. SHIPPING Representative samples shall be collected during the loading of trucks or railcars.
009	40,000 dry US tons – same as 006 due to bagging sampling location of Class A product	Jones Island Class A, with anaerobically digested primary solids and sometimes anaerobically digested secondary solids, dewatered, hot gas dried and stored sludge. BAGGING. Representative samples shall be collected during bagging at the bagging contractor's facility at the primary location (currently Milwaukee, Wisconsin).
010	100 dry US tons	Jones Island Class B, anaerobically digested, belt filter press cake. Representative samples shall be collected prior to prior to land application or landfilling.
012	N/A – New Sampling Point	Jones Island Class A, with anaerobically digested primary solids and sometimes anaerobically digested secondary solids, dewatered, hot gas dried and stored sludge. BAGGING. Representative samples shall be collected during bagging at an alternative bagging facility or contractor.
101	N/A – Field blank only, no flow rate	South Shore FIELD BLANK: Collect mercury field blank using standard sample handling procedures.
102	N/A – Field blank only, no flow rate	Jones Island FIELD BLANK: Collect mercury field blank using standard sample handling procedures.
103	27.4 MGD annual average (2019 – 2025)	Jones Island CSO TREATMENT: 24-hr composite samples for BOD and total suspended solids shall be collected at the discharge point from the inline storage system.
141	0 MGD	South Shore BLENDING: Sample point for reporting diverted flow from the primary clarifiers during high flow events. Flow bypasses the aeration basins and final clarifiers but receives disinfection prior to discharge.

Sample Point Designation		
Sample Point Number(s)	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/sample Contents and Treatment Description (as applicable)**
142	N/A – No flow meter	CITY WATER INTAKE: A grab sample of raw Lake Michigan water shall be collected from the Linnwood water supply facility, prior to receiving treatment.
104 - 123	N/A	Dropshaft locations throughout Inline Storage System (ISS). See section 4.1 of the permit for a complete list of sample locations.

Sample Point Designation for Groundwater Monitoring Systems		
System	**Well Number**	**Comments**
Northwest Side Relief Sewer – Depth to GW & GW Elevation	865, 875, 883, and 886	Depth to Groundwater and Groundwater Elevation wells for the Northwest Side Relief Sewer (NWSRS). See section 6.2.1 of the permit for Well ID and location of each well listed.
Inline Storage System – Depth to GW & GW Elevation	803, 806, 807, 808, 815, 816, 818, 831, 835, 836, 838, 840, 841, 861, 894, and 897	Depth to Groundwater and Groundwater Elevation wells for the Inline Storage System (ISS). See section 6.2.2 of the permit for Well ID and location of each well listed.
Northwest Side Relief Sewer – GW Quality	884 and 885	Groundwater quality wells for the Northwest Side Relief Sewer (NWSRS). See section 6.3.1 of the permit for Well ID and location of each well listed.
Inline Storage System (ISS) – GW Quality	805, 809, 810, 811, 812, 813, 814, 817, 824, 825, 826, 827, 828, 829, 830, 888, 889, and 890	Groundwater quality wells for the Inline Storage System (ISS). See section 6.3.2 of the permit for Well ID and location of each well listed.

1 Influent – Monitoring and Limitations

1.1 Sample Point Number: 701 – JONES ISLAND; 702 – SOUTH SHORE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total		mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	Daily	24-Hr Flow Prop Comp	
Cadmium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Chromium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Copper, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Lead, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Nickel, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Zinc, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Mercury, Total Recoverable		ng/L	Monthly	24-Hr Flow Prop Comp	See section 1.2.1.3 of the permit.

1.1.1 Changes from Previous Permit:

Mercury, Total Recoverable – The sample type was updated from '24-Hr Comp' to '24-Hr Flow Prop Comp' to match other parameters.

1.1.2 Explanation of Monitoring Requirements:

BOD_5 and Total Suspended Solids: Tracking of BOD_5, and Suspended Solids are required for percent removal requirements found in s. NR 210.05, Wis. Adm. Code and in Standard Requirements section of the permit.

Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc: Since MMSD is a control authority subject to state and federal pretreatment requirements, the permit will continue to include monitoring of influent for Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc as part of the pretreatment program.

Mercury, Total Recoverable: Mercury monitoring is included in the permit pursuant to s. NR 106.145, Wis. Adm. Code. Required field blanks for Mercury monitoring per ss. NR 106.145(9) and (10), Wis. Adm. Code, requirements. The permittee shall collect a mercury field blank for each set of mercury samples (a set of samples may include a combination of influent, effluent or other samples all collected on the same day). The permittee shall report results of influent and effluent samples and field blanks to the Department on Discharge Monitoring Reports. In accordance with s. NR 106.145(9)(a), Wis. Adm. Code, the sample type may be grab or 24-hr composite. Influent mercury concentrations reported from 2020-2025 at the Jones Island WRF and South Shore WRF averaged 48 ng/L and 58 ng/L respectively, therefore a high level of sensitivity is not required and the 24-hr composite sample is sufficient.

Monitoring Frequencies: The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. Due to the percent removal requirements in s. NR 210.05, Wis. Adm. Code, influent sample frequencies are set equal to effluent sample frequencies.

2 Cooling Water Intake Structure (CWIS) – Monitoring and Limitations

2.1 Sample Point Number: 703 – Jones Island Cooling Water Intake

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate	Daily Max	3.7 MGD	Daily	Continuous	
Intake Water Used Exclusively For Cooling		Percent	Daily	Calculated	

2.1.1 Changes from Previous Permit

Intake Water Used – The sample type was updated from 'continuous' to calculated'.

Flow Rate – A daily maximum flow rate of 3.7 MGD was added to meet BTA.

Conditions related to ch. NR 111, Wis. Adm. Code were removed.

2.1.2 Explanation of Monitoring Requirements

Cooling Water Intake Structures (CWIS): The Influent section includes the CWIS description and authorization for use. The permittee is authorized to use the cooling water intake structures during blending events which consists of the following:

703 Intake Structure

- **Location**: Milwaukee Inner Harbor, on the east bank of the Kinnickinnic River, 120 feet from the confluence with the Milwaukee River.
- **Source Waterbody Information**: $Q_{7,10}$ = 325 cfs, Mean Annual Harmonic Flow Rate = 283 cfs, and depth of 27 feet.
- **General Description**: Installed channel with a 4 ft. × 4 ft. opening, 16 bars with a width of 0.875", making total open area of 11.33 square feet.
- **Major Components**: Two parallel 10 ft wide traveling screens.
- **Maximum Design Intake Flow (DIF)**: The maximum design intake flow (DIF) is 8.6 MGD (13.3 cfs) (2 pumps at 4.3 MGD each), which is equivalent to 4.1 % of the $Q_{7,10}$. This is based upon the intake's pump capacity, not counting redundant or emergency pumps.
- **Maximum Through-Bars Design Intake Velocity**: The through-bars design intake velocity at the point of withdrawal is 1.17 feet/second (13.3 cfs /11.33 ft2).
- **Actual Intake Flow**: The actual intake flow is 1.3 MGD (1.9 cfs), which is equivalent to 0.6% of the $Q_{7,10}$.
- **Actual Intake Velocity**: The through-bars actual intake velocity at the point of withdrawal is 0.17 feet/second 1.9 cfs/11.33 ft2). These figures are based on the annual average withdrawal rate during January 2010 – March 2018.

2.2 Sample Point Number: 704 – Effluent Pump Station Cooling Water Intake

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
Intake Water Used Exclusively For Cooling		Percent	Daily	Calculated	

2.2.1 Changes from Previous Permit

Intake 704 – New sample point added for the effluent pump station cooling water intake.

2.2.2 Explanation of Monitoring Requirements

Cooling Water Intake Structures (CWIS): The Influent section includes the CWIS description and authorization for use. The permittee is authorized to use the cooling water intake structures during blending events which consists of the following:

704 Intake Structure

- **Location**: Lake Michigan, along the eastern edge of the Jones Island Water Reclamation Facility, approximately 650 feet south of the discharge of the Kinnickinnic River into the Inner Harbor of Lake Michigan.
- **General Description**: 42-inch diameter opening, 42-inch diameter ductile iron pipe, approximately 125 feet long, bringing lake water into a screening channel with a vertical bar screen and then to a wet well to be pumped into the service water system.
- **Major Components**: 125 feet of 42-inch diameter ductile iron pipe with a chlorine injection and diffuser system for zebra mussel control, two traveling water screens with 3/16-inch openings, six service water pumps rated at 3,000 gpm each.
- **Maximum Design Intake Flow (DIF)**: The maximum design intake flow (DIF) is 21.6 MGD (5 pumps at 3,000 gpm each) This is based upon the intakes pumps' capacity, counting all 5 available pumps. **Maximum Through-Bars Design Intake Velocity**: The through-bars design intake velocity at the point of withdrawal is 3.5 feet/second.
- **Actual Intake Velocity**: 2.0 ft/sec at the point where the water is withdrawn

- **Percent Used for Cooling**: Maximum 13% throughout the entire plant and both intake structures
- **Nearby Intakes**: Valley Power Plant, South Side of the Menomonee River, approximately 1.4 miles from MMSD's intake. Design flow of 158 MGD.

2.3 Ch. NR 111, Wis. Adm. Code Determination

The department determined that ch. NR 111, Wis. Adm. Code and associated cooling water intake conditions are not applicable at this time. Internal processes were updated and a majority of the time, effluent is reused throughout the treatment system for cooling and other maintenance purposes. However, during blending events, Milwaukee Met requested the flexibility to utilize the intake structure to use surface water for in-plant purposes.

In evaluating whether ch. NR 111, Wis. Adm. Code applies to this intake, the department evaluated the conditions in s. NR 111.02(2), Wis. Adm. Code. For ch. NR 111, Wis. Adm. Code to apply, all the conditions in s. NR 111.02(2), Wis. Adm. Code need to be met.

1. MMSD is defined as a point source as defined in s. 283.01(12), Wis. Stats.
2. MMSD's design intake flow is greater than 2 MGD.
3. MMSD does not use ≥25% of water withdrawn exclusively for cooling purposes.

In December 2025, MMSD provided additional calculations that demonstrated that a maximum of 13% of the water withdrawn would be used exclusively for cooling purposes. This was assuming a maximum cooling water flow of 3 MGD during blending, all withdrawn from the lake. Calculations using actual data from 2023, demonstrated that only 12.0% of the lake water was used exclusively for cooling purposes. Therefore, conditions related to ch. NR 111, Wis. Adm. Code were removed from the permit at this time.

MMSD is required to submit an annual actual intake flow report that includes 1) A calculation of the 'actual intake flow (AIF)' as defined by s. NR 111.03(1), Wis. Adm. Code, which is the average volume of water withdrawn on an annual basis by the cooling water intake structures over the previous 5 years. The calculation of AIF includes days of zero flow. AIF does not include flows associated with emergency and fire suppression capacity, 2) A list of the dates the intake structure was used during blending events, and 3) A summary of the uses of the intake water throughout the year pursuant permit sections 2.2.1.2 and 8.1.

BPJ BTA Determination: Best professional judgment BTA determinations are made using the Department's 2020 Guidance for Evaluating Intake Structures Using Best Professional Judgment. For existing intake structures, the guidance advises that intakes deemed BTA should fulfill at least one of the following eight criteria:

- Each water intake structure has a maximum design intake velocity of 0.5 feet per second (fps) OR a maximum actual intake velocity of 0.5 fps, demonstrated via measured or calculated values which show the maximum intake velocity as water passes through the intake system, measured perpendicular to the opening, does not exceed 0.5 fps at any point up until the first screen of mesh size 3/8" (or equivalent) or less.
- The facility operates a closed-cycle recirculating system that only requires make-up water with > 3 cycles of concentration on at least a daily basis. Cycles of concentration can be measured as the ratio of chloride levels in the recirculated water or blowdown relative to the chloride levels in the source water, or makeup water; or the make-up water volume divided by the blowdown volume (provided there aren't other water losses); or the blowdown water conductivity divided by the make-up water conductivity.
- The facility operates an intake structure that minimizes impingement rates by nature of its location (e.g. offshore velocity cap).
- The facility employs a system of technologies (e.g. wedge-wire screens, barrier nets; acoustic, light, or pH deterrent systems; variable speed pumps, etc.) that minimize impingement mortality rates.
- The facility operates a modified traveling screen in an optimal manner that does not promote re-impingement or predation of returned organisms.
- The facility's intake withdraws water at > 0.25 fps less than or equal to 16% of the time.
- There is data indicating that the impingement mortality rate has been/will be reduced 80-95% compared to a once-through cooling system with 3/8" traveling screens;
- There is biological data that affirmatively demonstrates that: 1) the source water body does not include threatened or endangered species in the vicinity of the intake, and 2) there are no aquatic life and water quality problems partly or solely due to the presence or operation of the intake structure.

And at least one of the following five criteria:

- The total water withdrawn (actual intake flow) is < 5% of the mean annual flow of the river on which the intake is located (if on a river or stream) OR the total quantity of the water withdrawn is restricted to a level necessary to maintain the natural thermal stratification or turnover patterns (where present) except in cases where the disruption is beneficial (if on a lake or reservoir)
- The facility operates at < 8% capacity utilization rate (with pumps turned off or, if variable frequency drives exist, down substantially during periods of non-operation) or at full capacity only for portions of days during a few months or less on an annual basis. If located in a spawning area, the period of water intake operation should not correspond with times when spawning, peak egg/larval abundance, or larval recruitment is occurring (depending on species present, usually between April – October).
- The facility operates a closed-cycle recirculating system that only requires make-up water with > 3 cycles of concentration on at least a daily basis. Cycles of concentration can be measured as the ratio of chloride levels in the recirculated water or blowdown relative to the chloride levels in the source water, or makeup water; or the make-up water volume divided by the blowdown volume (provided there aren't other water loses); or the blowdown water conductivity divided by the make-up water conductivity.
- The facility utilizes other means such as variable speed pumps, unit retirements, etc. to decrease entrainment rates by greater than or equal to 60% compared to a once-through cooling system with 3/8" traveling screens. Flow rate may be used as a surrogate for entrainment rates when determining percent reduction.
- There is biological data that affirmatively demonstrates that: 1) the source water body does not include threatened or endangered species in the vicinity of the intake, 2) there are no aquatic life and water quality problems partly or solely due to the presence or operation of the intake structure, and 3) the department biologist concurs that operation of the intake during periods of spawning, peak egg/larval abundance, and larval recruitment will not substantially impact populations or prey bases for the fishery.

And the following criteria:

- The facility-wide design intake flow (DIF) for all water intake structures is < 2 MGD (all intake water, cooling and non-cooling, is included in the determination of whether this DIF threshold is met) OR < 25% of the total water withdrawn is used exclusively for cooling purposes (water from a public water system, treated effluents, process water, gray water, wastewater, reclaimed water, or water used in a manufacturing process before or after it is used for cooling is not considered cooling water for the purposes of this determination)

The department has determined that the existing Effluent Pump Station CWIS (sample point 704) is BTA due to the infrequent usage of it. The department has determined that with a flow rate limit of 3.7 MGD the Jones Island CWIS (sample point 703) is BTA, since the flow rate limit will ensure the actual intake velocity is less than or equal to 0.5 feet per second at all times.

3 In-Plant - Monitoring and Limitations

3.1 Sample Point Number: 101 – Mercury Field Blank – South Shore & 102 – Mercury Field Blank – Jones Island

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	Monthly	Blank	See section 3.2.1.1 of the permit.

3.1.1 Changes from Previous Permit

No changes from previous permit.

3.1.2 Explanation of Monitoring Requirements

Required field blanks for Mercury monitoring per ss. NR 106.145(9) and (10), Wis. Adm. Code, requirements. The permittee shall collect a mercury field blank for each set of mercury samples (as set of samples may include a combination of influent, effluent or other samples all collected on the same day). The permittee shall report results of influent and effluent samples and field blanks to the Department on Discharge Monitoring Reports.

3.2 Sample Point Number: 103 – Combined Sewage Treatment at JONES ISLAND

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	Start flow measurement at the commencement of operations. Measure flow in daily increments until operation ends and report daily flow on the eDMR. See section 3.2.2.1 of the permit.
Time		hours	Daily	Calculated	Report the total duration in which the combined sewer treatment process is in

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					operation within a given day (12:00am - 11:59pm). See section 3.2.2.1 of the permit.
BOD5, Total		mg/L	Daily	24-Hr Comp	Start sampling at the commencement of operation. Sample in daily increments until the operation ends and report daily results on the eDMR. See section 3.2.2.1 of the permit.
Suspended Solids, Total		mg/L	Daily	24-Hr Comp	Start sampling at the commencement of operation. Sample in daily increments until the operation ends and report daily results on the eDMR. See section 3.2.2.1 of the permit.

3.2.1 Changes from Previous Permit

No changes from previous permit.

3.2.2 Explanation of Monitoring Requirements

Sample point 103 is included for measuring diverted flows during high flow events when peak flows exceed secondary treatment capacity at Jones Island and only after flow to the South Shore WRF is maximized. During these times, excess flows collected and stored in the inline storage (ISS) facility receive treatment equivalent to preliminary treatment and are routed around the primary clarifiers, aeration basins and final clarifiers and are recombined with fully treated effluent prior to the chlorine contact tank (disinfection). Monitoring of flows will track the volume of wastewater blended and help inform future decisions of whether additional measures are needed to prevent the discharge of partially treated wastewater. Monitoring for BOD and TSS are included to track the loading of this flow into the plant since it is not represented in the influent monitoring at sample point 701. All Outfall 002 effluent limitations apply to the partially treated wastewater when the process is in operation.

3.3 Sample Point Number: 141 – South Shore BLENDING

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	Start flow measurement at the commencement of blending operations. Measure flow in daily increments until operation ends and report daily flow

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					on the eDMR. See section 3.2.3.1 of the permit.
Time		hours	Daily	Calculated	Report the total duration of blending within a given day (12:00am - 11:59pm) in which blending occurs. See section 3.2.3.1 of the permit.

3.3.1 Changes from Previous Permit

No changes from previous permit.

3.3.2 Explanation of Monitoring Requirements

Sample point 141 was included for measuring diverted flows during high flow events when blending occurs in accordance with s. NR 210.12, Wis. Adm. Code. During these times, excess flows are routed around the aeration basins and final clarifiers and are recombined with fully treated effluent prior to the chlorine contact tank (disinfection). Monitoring of blended flows will track the volume of wastewater blended and help inform future decisions of whether additional measures are needed to prevent the discharge of partially treated wastewater. All Outfall 001 effluent limitations apply to partially treated wastewater when the process is in operation.

3.4 Sample Point Number: 142 – City Water Intake

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Arsenic, Total Recoverable		ug/L	Quarterly	Grab	See section 3.2.4.1 of the permit.
Mercury, Total Recoverable		ng/L	Quarterly	Grab	See section 3.2.4.2 of the permit.

3.4.1 Changes from Previous Permit:

No changes from the previous permit.

3.4.2 Explanation of Monitoring Requirements

Arsenic: During the previous permit, MMSD performed monitoring in the permit using acceptable analytical methodologies for total recoverable arsenic which produces the lowest limit of detection and limit of quantification. Utilizing background data from city water intake monitoring and effluent data, it was determined that a water quality-based effluent limit (WQBEL) is necessary for total recoverable arsenic in the next permit term. MMSD applied for an arsenic variance, under the provisions of s. 283.15, Wis. Stats. Intake Arsenic sampling will help the permittee determine the intake arsenic contribution to the effluent discharge and measure the effectiveness of their reductions through the pollutant minimization program.

Mercury: In an effort to collect up to date ambient water quality data to ensure compliance with the water quality criteria at Outfall 002, mercury monitoring is also included at Sample Point 142 and is consistent with s. NR 106.06(2)(br)3.d., Wis. Adm. Code.

4 Combined Sewer System (CSS) Requirements

4.1 Dropshaft Sample Point Numbers: 104- NS4 - Cambridge & Providence; 105- NS5 - Burleigh & Milw. River; 106- NS6 - Park Place & Milw. River; 107- NS7 - Commerce & Booth; 108- NS8 - Commerce & Pleasant; 109- NS9 - N MLK Jr Dr & Mckinley; 110- NS10 - Water & St. Paul; 111- NS11 - Humboldt & Capitol; 112- NS12 - 31st & Capitol; 113- CT2 - Hawley & State; 114- CT3/4 - 44th & Wells; 115- CT5/6 - 25th & Menomonee River; 116- CT7 - 16th & Canal; 117- CT8 - 3rd & Seeboth; 118- KK1 - 6th & Cleveland; 119- KK2 - 1st & Chase; 120- KK3 - 4th & Becher; 121- KK4 - 1st & Lincoln; 122- LMN - Bay & Ward; 123- LMS - Lincoln Mem. & Russell

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Volume		MG	Per Occurrence	Calculated	
Fecal Coliform		#/100 ml	Per Occurrence	Grab	
E. coli		#/100 ml	Per Occurrence	Grab	
BOD5, Total		mg/L	Per Occurrence	Grab	
Suspended Solids, Total		mg/L	Per Occurrence	Grab	
Phosphorus, Total		mg/L	Per Occurrence	Grab	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Per Occurrence	Grab	

4.1.1 Changes from Previous Permit:

No changes from previous permit.

4.1.2 Explanation of Monitoring Requirements

A grab sample shall be taken during each overflow event at each ISS dropshaft location identified in section 4.1 of the permit. Monitoring and reporting on volume allows the Department to automatically track CSO volumes within the system database. Through the implementation of MMSD's pretreatment program and based on review of the data submitted for the total recoverable metals, it was determined that monitoring for these parameters is no longer required. Sampling for fecal coliform, E. coli, BOD_5, Total Suspended Solids, Total Phosphorus, and Ammonia Nitrogen, are retained in the permit, so the permittee may continue to effectively characterize CSO impacts and the efficacy of CSO controls.

4.2 Combined Sewer Overflow (CSO) Requirements

Discharges from the combined sewer overflows shall be limited, monitored, and reported by the permittee in accordance with the permit conditions listed in sections 4.3.2 through 4.3.5, s. NR 210.205, Wis. Adm. Code, and the U.S. EPA CSO Control Policy. An inventory of combined sewer overflow locations is listed in section 4.3.1, Tables 4.3.1(a) – 4.3.1(g) of the permit.

4.2.1 Collection System Operational Requirements

The operational conditions listed in section 4.3.3 of the permit are included to direct the permittee to implement and properly maintain the selected CSO controls. The following requirements were removed from the permit as they are either covered by other sections of the permit or are being implemented as part of the permittee's CMOM program;

- The permittee shall provide an estimation of the duration of each CSO discharge event and for estimating the volume discharged during each overflow event. The Permittee shall provide records of junction chamber levels to verify that no discharges are occurring from any outfall when the gate at the corresponding dropshaft is open, unless the capacity of the associated near surface collector is exceeded.
- All intercepting structures tributary to junction chambers receiving Metropolitan Interceptor Sewer (MIS) overflows during dry weather periods shall be checked monthly.

4.2.2 Operational and Technology-Based Requirements

This section contains the nine minimum controls required by EPA and is consistent with the CSO Control Policy and public notification requirements. Activities to further enhance implementation of the nine minimum controls are further defined throughout section 4 of the permit.

4.2.3 CSO Performance Standards for Water Quality-Based Requirements

This section defines operational performance standards for the permittee to maximize storage and treatment of combined sewer waste. The permittee has completed extensive infrastructure projects to convey and treat wet weather flows, including construction of the ISS.

The language has been updated in section 4.3.5 of the permit that no more than three combined sewer overflows as a 5-year rolling average may occur. The permit also maintains a second condition to determine compliance with the CSO guidance. The capture and delivery to either the Jones Island or South Shore WRF of no less than 85% by volume of the system-wide combined sewage collected in the Combined Sewer System (CSS) as the result of precipitation events on an annual average basis. The equation used to calculate the percent volume captured for treatment is included in the permit. The Permittee must meet **both** of these criteria to achieve compliance.

Primary Treatment and Surface Water Quality Monitoring requirements were broken out into their own sections to separate and clearly define these requirements. The permittee's ongoing surface water quality monitoring program described in the most recent Surface Water Quality Monitoring Plan will be used to track water quality through the life of the permit. The permittee shall provide reports of the monitoring results annually by June 30th of the following year in accordance with section 8.3 of the permit.

Permit section 4.3.5.3 Water Quality-Based Requirements – Wet Weather Management outlines how the permittee plans to meet the CSO standards in section 4.3.4 of the permit and is consistent with the Long-Term Control Plan. To reduce the duration, frequency, and magnitude of the overflows, and to reduce the adverse effects of overflows, the permittee shall implement wet weather management programs. In general the permittee is required to implement wet weather management programs that work to: 1) Reduce the volume and peak flow rate of runoff entering the sewerage system, 2) Reduce inflow related to flooding by reducing the number of structures in the regional floodplain, 3) Reduce inflow and infiltration in tributary sewerage systems, 4) Reduce non-point pollutant loadings into area waterways, and 5) Improve aquatic habitat to increase the number and diversity of species. The permittee shall also facilitate the implementation of

green infrastructure detention capacity in watersheds within or tributary to the permittee's service area. The target total green infrastructure detention capacity to be achieved during the term of this permit is 50 million gallons.

4.2.4 CSO Discharge Reporting Requirements

Reporting requirements for CSO discharges are outlined in section 4.3.6 of the permit and were updated to incorporate EPA's Public Notification Requirements for Combined Sewer Overflows to the Great Lakes which became effective on February 7, 2018.

The Department does not have a specific form to report CSO discharges, so in accordance with ss. NR 210.205, NR 210.23(4)(f), and NR 210.21(4)-(6), Wis. Adm. Code, the permittee shall report CSO discharges using form 3400-184. Since form 3400-184 is specific to SSO and TFO discharges, the permittee must clearly denote when the form is being used to report a CSO and the manner in which the information is entered into the form may be modified pending Department approval.

5 Surface Water - Monitoring and Limitations

5.1 Sample Point Number: 001 – SOUTH SHORE EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Weekly Avg	45 mg/L	Daily	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	30 mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	Daily	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Nitrogen, Ammonia (NH3-N) Total	Daily Max	27 mg/L	Daily	24-Hr Flow Prop Comp	Year-round monitoring. Limit effective November – April.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	27 mg/L	Daily	24-Hr Flow Prop Comp	Year-round monitoring. Limit effective November – April.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	27 mg/L	Daily	24-Hr Flow Prop Comp	Year-round monitoring. Limit effective November – April.
Chlorine, Total Residual	Daily Max	38 ug/L	Daily	Grab	
Chlorine, Total Residual	Weekly Avg	38 ug/L	Daily	Grab	
Chlorine, Total Residual	Monthly Avg	38 ug/L	Daily	Grab	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Fecal Coliform	Geometric Mean - Wkly	972 #/100 ml	Daily	Grab	Limit effective October through April annually. Effective as interim limit May through September annually until the E. coli limit goes into effect per the Effluent Limitations for E. coli Schedule.
Fecal Coliform	Geometric Mean - Monthly	400 #/100 ml	Daily	Grab	Limit effective October through April annually. Effective as interim limit May through September annually until the E. coli limit goes into effect per the Effluent Limitations for E. coli Schedule.
E. coli		#/100 ml	Daily	Grab	Monitoring only May through September annually until the final limit goes into effect per the Effluent Limitations for E. coli Schedule.
E. coli	Geometric Mean - Monthly	126 #/100 ml	Daily	Grab	Limit effective May through September annually per the Effluent Limitations for E. coli Schedule.
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Limit effective May through September annually per the Effluent Limitations for E. coli Schedule. See the E. coli Percent Limit section in the permit. Enter the result in the DMR on the last day of the month.
Phosphorus, Total	Monthly Avg	1.0 mg/L	Daily	24-Hr Flow Prop Comp	
Phosphorus, Total	6-Month Avg	0.6 mg/L	Daily	24-Hr Flow Prop Comp	See section 5.2.1.7 of the permit.
Arsenic, Total Recoverable	Daily Max	1.5 µg/L	Monthly	24-Hr Flow Prop Comp	See sections 5.2.1.3 through 5.2.1.5 of the permit.
Mercury, Total Recoverable	Daily Max	3.7 ng/L	Monthly	Grab	See sections 5.2.1.3 and 5.2.1.6 of the permit.
Cadmium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.1.3 of the permit.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Chromium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.1.3 of the permit.
Copper, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.1.3 of the permit.
Lead, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.1.3 of the permit.
Nickel, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.1.3 of the permit.
Zinc, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.1.3 of the permit.
Temperature Maximum		deg F	Daily	Continuous	Monitoring in calendar year 2029 (January – December). See section 5.2.1.8 of the permit.
PFOS		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
PFOA		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Nitrite + Nitrate Total		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Total		mg/L	Quarterly	Calculated	Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.
Acute WET		TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	Sample annually in rotating quarters. See WET permit section 5.2.1.11.
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	Sample annually in rotating quarters. See WET permit section 5.2.1.11.

5.1.1 Changes from Previous Permit

Fecal Coliform/ E. coli – During the recreation season (May – Sept), fecal coliform monitoring and limits have been replaced with Escherichia coli (E. coli) monitoring and limits.

Phosphorus, Total – The 6-month average limit was decreased from 0.7 mg/L to 0.6 mg/L.

Arsenic, **Total Recoverable –** A daily maximum limit of 1.5 μg/L has been included.

Mercury, Total Recoverable – The daily maximum limit was decreased to 3.7 ng/L.

Temperature Maximum – Monitoring is included in calendar year 2029 only. The sample frequency was increased from "3/week" to "daily".

PFOS and PFOA – Monthly monitoring is in included in the permit in accordance with s. NR 106.98(2)(c), Wis. Adm. Code.

Total Nitrogen Monitoring (TKN, N02+N03 and Total N) – Quarterly monitoring was added to the permit.

5.1.2 Explanation of Limits and Monitoring Requirements

Monitoring Frequencies: The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term.

Expression of Limits: In accordance with the federal regulation 40 CFR 122.45(d) and s. NR 205.065, Wis. Adm. Code, limits in this permit are to be expressed as weekly average and monthly average limits.

Categorical Limits

- **BOD_5, Total Suspended Solids, pH, and Fecal Coliform:** Standard municipal wastewater requirements for BOD5, total suspended solids, and pH are included based on ch. NR 210, Wis. Adm. Code 'Sewage Treatment Works' requirements for discharges to fish and aquatic life streams. Chapter NR 102, Wis. Adm. Code 'Water Quality Standards for Surface Waters' also specifies requirements for pH for fish and aquatic life streams.

Water Quality Based Limits, WET Requirements, and Disinfection

Refer to the Water Quality-Based Effluent Limitations (WQBELs) memo for the South Shore WRF, prepared by Nicole Krueger dated April 17, 2024 (updated on September 2, 2025) and used for this reissuance.

- **Ammonia (NH3-N) Total Nitrogen:** Current acute and chronic ammonia toxicity criteria for the protection of aquatic life are included in Table 2C and Table 4B of ch. NR 105, Wis. Adm. Code (effective March 1, 2004). Subchapter IV of ch. NR 106 establishes procedures for calculating water quality-based effluent limitations (WQBELs) for ammonia (effective March 1, 2004). The WQBEL memo failed to identify a daily maximum ammonia limit (27 mg/L) that was included in the previous permit effective November through April. This current daily maximum ammonia limit is retained in the permit.
- **Chlorine, Total Residual:** Chlorine is added at the South Shore WRF as a disinfectant, therefore effluent limitations are included to assure proper operation of the dechlorination system. Disinfection occurs year-round so chlorine monitoring and limitations are also effective year-round.
- **Disinfection & E. coli**: Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020. The new rule requires that WPDES permits for facilities with required disinfection include monitoring for E. coli while facilities are disinfecting during the recreation period and establish effluent limitations for E. coli established in s. NR 210.06 (2), Wis. Adm. Code. Due to the fact that South Shore WRF effluent discharges into a public drinking water, year-round disinfection is required. E. coli limits will be effective during the recreation season (May through Sept) beginning May 1, 2031 per the compliance schedule in permit section 8.6. Fecal coliform limits will remain year-round until April 30, 2031, which then they will only be effective during the nonrecreational season (Oct through April).
- **Phosphorus, Total:** Phosphorus requirements are based on the Phosphorus Rules that became effective 12/1/2010 as detailed in NR 102 Water Quality Standards and NR 217 Effluent Standards and Limitations for Phosphorus. Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface

waters. The code categorically limits municipal dischargers of more than 150 pounds of phosphorus per month to 1.0 mg/L unless an alternative limit is approved. Therefore, a 1.0 mg/L monthly average limit is included.

Chapter NR 217, Wis. Adm. Code, also specifies WQBELs (water quality based effluent limits) for discharges of phosphorus to surface waters of the state from publicly and privately-owned wastewater facilities, noncontact cooling water discharges which contain phosphorus, concentrated animal feeding operations that discharge through alternative treatment facilities and a facility/site that is regulated under ch. NR 216, Wis. Adm. Code where the standards in chs. NR 151 and NR 216, Wis. Adm. Code are not sufficient to meet phosphorus criteria. WQBELs for phosphorus are needed whenever the discharge contains phosphorus at concentrations or loadings that will cause or contribute to an exceedance of the water quality standards. Section NR 102.06(5)(b), Wis. Adm. Code, specifies a total phosphorus criterion of 7 µg/L (0.007 mg/L) for the open and near shore waters of Lake Michigan. For discharges directly to the Great Lakes, s. NR 217.13(4), Wis. Adm. Code, says that the Department shall set effluent limits consistent with near shore or whole lake models approved by the Department. At this time there is no model available, although work is ongoing by a contractor to EPA Region 5. The six-month average interim limit of 0.7 mg/L was lowered to 0.6 mg/L and included in the permit. The permittee shall continue to reduce phosphorus as much as practical from their discharge. This approach is consistent with other municipal dischargers to Lake Michigan.

- **Arsenic, Total Recoverable:** During the previous permit, MMSD performed monitoring in the permit using acceptable analytical methodologies for total recoverable arsenic which produces the lowest limit of detection and limit of quantification. Utilizing background data from city water intake monitoring and effluent data, it was determined that a water quality-based effluent limit (WQBEL) is necessary for total recoverable arsenic in the next permit term. MMSD applied for an arsenic variance, under the provisions of s. 283.15, Wis. Stats. The Department reviewed MMSD's application for an arsenic variance and the information supplied in the application supports the establishment of an interim effluent limit. The permittee and the Department have reached agreement on an interim arsenic limit of 1.5 ug/L (expressed as a daily maximum), implementation of an arsenic pollutant minimization plan, and submittal of annual progress reports each year by January 31st. The arsenic pollutant minimization measures that are required to be implemented can be found in the permit.
- **Mercury, Total Recoverable:** MMSD has requested an extension of a mixing zone phase out exception for mercury. The Department has granted the exception which applies only to the 5-year permit term of the WPDES permit. Requirements for mercury are included in s. NR 106.145 Wis. Adm. Code. In accordance with s. NR 106.06(2)(br)3.c., Wis. Adm. Code, the permit shall contain a numeric effluent limit. Therefore, a daily maximum limit of 3.7 ng/L with monthly monitoring is included in the permit.
- **Cadmium, Chromium, Copper, Lead, Nickel and Zinc:** Since MMSD is a control authority subject to state and federal pretreatment requirements, the permit will continue to include monitoring of effluent for cadmium, chromium, copper, lead, nickel and zinc.
- **Whole Effluent Toxicity:** Whole effluent toxicity (WET) testing requirements and limits (if applicable) are determined in accordance with ss. NR 106.08 and NR 106.09 Wis. Adm. Code, as revised August 2016. See the current version of the Whole Effluent Toxicity Program Guidance Document and checklist and WET information, guidance and test methods at http://dnr.wi.gov/topic/wastewater/wet.html. A complete checklist can be found in the WQBEL memo. Acute and Chronic WET tests are scheduled in the following rotating quarters: *October – December 2026; July – September 2027; April – June 2028; January – March 2029; and October – December 2030*
- **Temperature Maximum:** Available temperature data indicated the apparent need for sub-lethal weekly average temperature limitations for the months of September – March and June pursuant to the procedures in ch. NR 106, Wis. Adm. Code. Therefore, sub lethal weekly average effluent limitations should be included in the permit. However, s. NR 106.59(4), Wis. Adm. Code, allows publicly operated treatment works to perform a dissipative cooling (DC) demonstration, which if successful, justifies exclusion of sub lethal weekly average effluent temperature limits in municipal discharge permits. MMSD has submitted a successful DC demonstration which

was approved by the Department in 2012 and the permittee has stated that there haven't been any significant changes in the expected effluent temperatures and industrial loading has recently decreased.

The permit includes daily temperature maximum monitoring in the fourth year of the permit, calendar year 2029, and will be used for the next permit reissuance. In addition**,** dissipative cooling requests must be re-evaluated every permit reissuance. The permittee is responsible to submit an updated DC request as part of the permit application. Such a request must either include:

a) A statement by the permittee that there have been no substantial changes in operation of, or thermal loadings to, the treatment facility and the receiving water; or
b) New information demonstrating DC to supplement the information used in the previous DC determination. If significant changes in operation or thermal loads have occurred, additional DC data must be submitted to the Department.

- **PFOS and PFOA:** NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. At the first reissuance of a WPDES permit after August 1, 2022, the new rule requires WPDES permits for major municipal dischargers, with an average flow rate greater than or equal to 5 MGD, at a minimum sample effluent on a monthly basis for PFOS and PFOA pursuant s. NR 106.98(2)(a), Wis. Adm. Code. The initial determination of the need for sampling shall be conducted for up to two years in order to determine if the permitted discharge has the reasonable potential to cause or contribute to an exceedance of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

- **Total Nitrogen Monitoring (NO2+NO3, TKN and Total N):** The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under s. 283.55(1)(e), Wis. Stats. Testing is required quarterly.

5.2 Sample Point Number: 002 – JONES ISLAND EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Weekly Avg	45 mg/L	Daily	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	30 mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	51,332 lbs/day	Daily	Calculated	Effective January, March, May, July, August, October, and December
Suspended Solids, Total	Weekly Avg	56,832 lbs/day	Daily	Calculated	Effective February
Suspended Solids, Total	Weekly Avg	53,043 lbs/day	Daily	Calculated	Effective April, June, September, and November
Suspended Solids, Total	Monthly Avg	30,195 lbs/day	Daily	Calculated	Effective January, March, May, July, August, October, and December
Suspended Solids, Total	Monthly Avg	33,430 lbs/day	Daily	Calculated	Effective February

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Suspended Solids, Total	Monthly Avg	31,202 lbs/day	Daily	Calculated	Effective April, June, September, and November
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Daily	24-Hr Flow Prop Comp	
Chlorine, Total Residual	Daily Max	38 ug/L	Daily	Grab	
Chlorine, Total Residual	Weekly Avg	36 ug/L	Daily	Grab	
Chlorine, Total Residual	Monthly Avg	36 ug/L	Daily	Grab	
Fecal Coliform	Geometric Mean - Wkly	972 #/100 ml	Daily	Grab	Limit effective October through April annually. Effective as interim limit May through September annually until the E. coli limit goes into effect per the Effluent Limitations for E. coli Schedule.
Fecal Coliform	Geometric Mean - Monthly	400 #/100 ml	Daily	Grab	Limit effective October through April annually. Effective as interim limit May through September annually until the E. coli limit goes into effect per the Effluent Limitations for E. coli Schedule.
E. coli		#/100 ml	Daily	Grab	Monitoring only May through September annually until the final limit goes into effect per the Effluent Limitations for E. coli Schedule.
E. coli	Geometric Mean - Monthly	126 #/100 ml	Daily	Grab	Limit effective May through September annually per the Effluent Limitations for E. coli Schedule.
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Limit effective May through September annually per the Effluent Limitations for E. coli Schedule. See the E. coli Percent Limit section in the permit. Enter the result in

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					the DMR on the last day of the month.
Phosphorus, Total	Monthly Avg	0.66 mg/L	Daily	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	664 lbs/day	Daily	Calculated	Effective January, March, May, July, August, October, and December
Phosphorus, Total	Monthly Avg	735 lbs/day	Daily	Calculated	Effective February
Phosphorus, Total	Monthly Avg	686 lbs/day	Daily	Calculated	Effective April, June, September and November
Mercury, Total Recoverable	Daily Max	4.1 ng/L	Monthly	Grab	See sections 5.2.2.5 and 5.2.2.7 of the permit.
Arsenic, Total Recoverable		ug/L	Quarterly	24-Hr Flow Prop Comp	See sections 5.2.2.5 and 5.2.2.6 of the permit.
Cadmium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.2.5 of the permit.
Chromium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.2.5 of the permit.
Copper, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.2.5 of the permit.
Lead, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.2.5 of the permit.
Nickel, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.2.5 of the permit.
Zinc, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See section 5.2.2.5 of the permit.
Temperature Maximum		deg F	Daily	Continuous	Monitoring in calendar year 2029 (January – December). See section 5.2.2.8 of the permit.
PFOS		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
PFOA		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Nitrite + Nitrate Total		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Total		mg/L	Quarterly	Calculated	Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Total Nitrite + Nitrate Nitrogen.
Acute WET		TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	Sample annually in rotating quarters. See WET permit section 5.2.2.11.
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	Sample annually in rotating quarters. See WET permit section 5.2.2.11.

5.2.1 Changes from Previous Permit

Fecal Coliform/ E. coli – During the recreation season (May – Sept), fecal coliform monitoring and limits have been replaced with Escherichia coli (E. coli) monitoring and limits.

Mercury, Total Recoverable – The daily maximum limit was decreased to 4.1 ng/L.

Temperature Maximum – Monitoring is included in calendar year 2029 only. The sample frequency was increased from "3/week" to "daily".

PFOS and PFOA – Monthly monitoring is in included in the permit in accordance with s. NR 106.98(2)(c), Wis. Adm. Code.

Total Nitrogen Monitoring (TKN, N02+N03 and Total N) – Quarterly monitoring was added to the permit.

5.2.2 Explanation of Limits and Monitoring Requirements

Monitoring Frequencies: The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term.

Expression of Limits: In accordance with the federal regulation 40 CFR 122.45(d) and s. NR 205.065, Wis. Adm. Code, limits in this permit are to be expressed as weekly average and monthly average limits.

Categorical Limits

- **BOD_5, Total Suspended Solids, pH, and Fecal Coliforms:** Standard municipal wastewater requirements for BOD_5, total suspended solids, dissolved oxygen, pH, and fecal coliforms are included based on ch. NR 210, Wis. Adm. Code 'Sewage Treatment Works' requirements for discharges to fish and aquatic life receiving waters. Chapter NR 102, Wis. Adm. Code 'Water Quality Standards for Surface Waters' also specifies requirements for pH for fish and aquatic life.

Water Quality Based Limits, WET Requirements and Disinfection

Refer to the Water Quality-Based Effluent Limitations (WQBELs) memo for the Jones Island WRF, prepared by Nicole Krueger dated April 17, 2024 (updated on September 2, 2025) and used for this reissuance.

- **Total Suspended Solids:** Limit expression requirements for municipal POTWs found in 40 CFR 122.45(d) and s. NR 106.07, Wis. Adm. Code state that weekly and monthly average limits must be included in permits where limits are determined to be necessary. The Milwaukee River Basin TMDL provides monthly wasteload

allocations (WLAs) for Total Suspended Solids in Appendix A of the approved TMDL report. These monthly WLAs must be included in WPDES permits and are expressed in lbs/day for the month by dividing the monthly wasteload allocation by the number of days in each month. Weekly average mass limits were calculated using the specific monitoring frequency and the coefficient of variation for representative data. A monthly to weekly average multiplier of 1.70 was applied to the monthly WLAs. This multiplier is higher than typical due to the variability in flows and loading from the combined sewer area. The following weekly average and monthly average mass limits are included in the permit:

Total Suspended Solids (TSS) Effluent Limitations

Month	Weekly Average TSS Effluent Limit (lbs/day)	Monthly Average TSS Effluent Limit (lbs/day)
January	51,332	30,195
February	56,832	33,430
March	51,332	30,195
April	53,043	31,202
May	51,332	30,195
June	53,043	31,202
July	51,332	30,195
August	51,332	30,195
September	53,043	31,202
October	51,332	30,195
November	53,043	31,202
December	51,332	30,195

- **Ammonia (NH3-N) Total Nitrogen:** Current acute and chronic ammonia toxicity criteria for the protection of aquatic life are included in Tables 2C and 4B of ch. NR 105, Wis. Adm. Code (effective March 1, 2004). Subchapter III of ch. NR 106, Wis. Adm. Code, establishes the procedure for calculating water quality based effluent limitations (WQBELs) for ammonia (effective March 1, 2004). Based on available data for the discharge from the Jones Island WRF, there is no reasonable potential to include daily, weekly or monthly limits in the permit; however, daily effluent monitoring is retained.
- **Chlorine, Total Residual:** Chlorine is added at the Jones Island WRF as a disinfectant, therefore effluent limitations are included to assure proper operation of the dechlorination system. Disinfection occurs year-round so chlorine monitoring and limitations are also effective year-round.
- **Disinfection & E. coli:** Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020. The new rule requires that WPDES permits for facilities with required disinfection include monitoring for E. coli while facilities are disinfecting during the recreation period and establish effluent limitations for E. coli established in s. NR 210.06 (2), Wis. Adm. Code. Due to the fact that Jones Island WRF effluent discharges into a public drinking water, year-round disinfection is required. E. coli limits will be effective during the recreation season (May through Sept) beginning May 1, 2030 per the compliance schedule in permit section 8.7. Fecal coliform limits will remain year-round until April 30, 2030, which then they will only be effective during the nonrecreational season (Oct through April).
- **Phosphorus, Total:** Wasteload allocations specified in TMDLs are expressed as water quality based effluent limits (WQBELs) in WPDES permits. The waste load allocated-derived WQBELs are consistent with the assumptions and requirements of the approved Milwaukee River Basin TMDL for total phosphorus, which was approved by US EPA in March 2018. The TMDL includes daily and monthly WLA for total phosphorus. However, for the reasons explained in the April 30, 2012 paper entitled 'Justification for Use of Monthly,

Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin', WDNR has determined that it is impracticable to express the phosphorus WQBEL for the permittee as a maximum daily or weekly value. Therefore, only monthly WLA-derived WQBELs are included in the permit and are expressed in lbs/day as a monthly average. The 0.66 mg/L monthly average limit from the previous permit is retained in the permit, because it was effective before EPA approval of the Milwaukee River Basin TMDL. In summary, the following final TMDL-based effluent limits for phosphorus, expressed as a monthly average, are included in the permit:

Total Phosphorus Effluent Limitations

Month	Monthly Average TP Effluent Limit (lbs/day)
January	664
February	735
March	664
April	686
May	664
June	686
July	664
August	664
September	686
October	664
November	686
December	664

- **Mercury, Total Recoverable:** MMSD has requested an extension of a mixing zone phase out exception for mercury. The Department has granted the exception which applies only to the 5-year permit term of the WPDES permit. Requirements for mercury are included in s. NR 106.145 Wis. Adm. Code. In accordance with s. NR 106.06(2)(br)3.c., Wis. Adm. Code, the permit shall contain a numeric effluent limitation. Therefore, a daily maximum limit of 4.1 ng/L with monthly monitoring is included in the permit.
- **Arsenic, Total Recoverable:** During the previous permit, MMSD performed monitoring in the permit using acceptable analytical methodologies for total recoverable arsenic which produce the lowest limit of detection and limit of quantification. Utilizing background data from city water intake monitoring and effluent data, it was determined that a water quality-based effluent limit (WQBEL) is not necessary for total recoverable arsenic in the next permit term. Quarterly monitoring is included in the permit.
- **Cadmium, Chromium, Copper, Lead, Nickel and Zinc:** Since MMSD is a control authority subject to state and federal pretreatment requirements, the permit will continue to include monitoring of effluent for cadmium, chromium, copper, lead, nickel and zinc.
- **Temperature Maximum:** Available temperature data indicated the apparent need for sub-lethal weekly average temperature limitations for the months of July – March, pursuant to the procedures in ch. NR 106, Wis. Adm. Code. Therefore, sub-lethal weekly average effluent limitations should be included in the permit. However, ch. NR 106.59(4), Wis. Adm. Code, allows publicly operated treatment works to perform a dissipative cooling (DC) demonstration, which if successful, justifies exclusion of sub-lethal weekly average effluent temperature limits in municipal discharge permits. MMSD has submitted a successful DC demonstration which was approved by the Department in 2012 and the permittee has stated that there haven't been any significant changes in the expected effluent temperatures and industrial loading has recently decreased.
  The permit includes daily temperature maximum monitoring in the fourth year of the permit, calendar year 2029, and will be used for the next permit reissuance. In addition, dissipative cooling requests must be re-evaluated

every permit reissuance. The permittee is responsible to submit an updated DC request as part of the permit application. Such a request must either include:

a) A statement by the permittee that there have been no substantial changes in operation of, or thermal loadings to, the treatment facility and the receiving water; or
b) New information demonstrating DC to supplement the information used in the previous DC determination. If significant changes in operation or thermal loads have occurred, additional DC data must be submitted to the Department.

- **PFOS and PFOA:** NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. At the first reissuance of a WPDES permit after August 1, 2022, the new rule requires WPDES permits for major municipal dischargers, with an average flow rate greater than or equal to 5 MGD, at a minimum sample effluent on a monthly basis for PFOS and PFOA pursuant s. NR 106.98(2)(a), Wis. Adm. Code. The initial determination of the need for sampling shall be conducted for up to two years in order to determine if the permitted discharge has the reasonable potential to cause or contribute to an exceedance of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

- **Total Nitrogen Monitoring (NO2+NO3, TKN and Total N):** The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under s. 283.55(1)(e), Wis. Stats. Testing is required quarterly.

- **Whole Effluent Toxicity:** Whole effluent toxicity (WET) testing requirements and limits (if applicable) are determined in accordance with ss. NR 106.08 and NR 106.09, Wis. Adm. Code, as revised August 2016. See the current version of the Whole Effluent Toxicity Program Guidance Document and checklist and WET information, guidance and test methods at http://dnr.wi.gov/topic/wastewater/wet.html. A complete checklist can be found in the WQBEL memo dated September 2025. Acute and Chronic WET tests are scheduled in the following rotating quarters: *October – December 2026; July – September 2027; April – June 2028; January – March 2029; and October – December 2030*

6 Groundwater – Monitoring and Limitations

Refer to the NR 140 Groundwater Evaluation for the Milwaukee Metro Sewerage District Inline Storage System and Northwest Side Relief Sewer System, dated October 4, 2023 and prepared by Zach Watson, WDNR Hydrogeologist.

6.1 Groundwater Level Monitoring Requirements

6.1.1 Groundwater Monitoring System – Northwest Side Relief Sewer

Location of Monitoring system: Northwest Side Relief Sewer

Wells to be Monitored: NWSR-1 (Well **865**), NWSR-22 (Well **875**), NWSR-31 (Well **883**), GM-IR-12 (Well **886**)

Well Used To Calculate PALs: Not Applicable

Enforcement Standard Wells: Not Applicable

Parameter	Units	Preventative Action Limit	Enforcement Standard	Monitoring Frequency	Reporting Frequency
Depth To Groundwater	feet	*****	N/A	Monthly	Monthly
Groundwater Elevation	feet MSL	*****	N/A	Monthly	Monthly
Peak Hourly Volume of NWSRS	MG	N/A	N/A	Monthly	Monthly

6.1.1.1 Changes from Previous Permit:

The monitoring frequency for all parameters has been decreased from "daily" to "monthly".

The level measurement type for Well 886 was updated from "continuous" to "non-continuous."

6.1.1.2 Explanation of Limits and Monitoring Requirements

The Northwest Side Relief Sewer System was installed within the state's groundwater aquifer system. The Department has imposed a number of operational requirements both as conditions of plan approval and as permit requirements. These requirements set a maximum operating level (maximum hydraulic pressure within the tunnels) for the system and required that a minimum higher pressure be maintained in the aquifer outside the tunnel walls, and that groundwater around the system be monitored for contamination. These conditions were consistent with the design and operation of the system as proposed by the permittee.

6.1.2 Groundwater Monitoring System – Inline Storage System (ISS)

Location of Monitoring system: General vicinity of MMSD Inline Storage System

Wells to be Monitored: CT-MW-01 (Well **803**), CT-MW-05 (Well **806**), CT-MW-10 (Well **807**), CT-MW-07 (Well **808**), NS-MW-05 (Well **815**), NS-MW-06 (Well **816**), NS-MW-08 (Well **818**), CT-MR-08D (Well **831**), CT-MW-02 (Well **835**), CT-MW-06 (Well **836**), NS-MR-01D (Well **838**), CT-MW-11 (Well **840**), CT-MW-12 (Well **841**), KK-MW-05 (Well **861**), WA-AL-4 (Well **894**), J10-36-PZ (Well **897**)

Well Used To Calculate PALs: Not Applicable

Enforcement Standard Wells: Not Applicable

Parameter	Units	Preventative Action Limit	Enforcement Standard	Monitoring Frequency	Reporting Frequency
Depth To Groundwater	feet	*****	N/A	Monthly	Monthly
Groundwater Elevation	feet MSL	*****	N/A	Monthly	Monthly
Water Surface Elevation of Tunnel (PS0801)	feet MSL	*****	N/A	Monthly	Monthly
Net Positive Head	feet	N/A	N/A	Monthly	Monthly

6.1.2.1 Changes from Previous Permit:

The monitoring frequency for all parameters has been decreased from "daily" to "monthly".

The following wells have been abandoned and thus removed from the permit: Well 801

6.1.2.2 Explanation of Limits and Monitoring Requirements

The Inline Storage System was installed within the state's groundwater aquifer system. The Department has imposed a number of operational requirements both as conditions of plan approval and as permit requirements. These requirements set a maximum operating level (maximum hydraulic pressure within the tunnel) for the system and required that a minimum higher pressure be maintained in the aquifer outside the tunnel walls, and that groundwater around the system be monitored for contamination. These conditions were consistent with the design and operation of the system as proposed by the permittee.

6.2 Groundwater Quality Requirements and Limitations

6.2.1 Groundwater Monitoring System for GW Quality – Northwest Side Relief Sewer

Location of Monitoring system: General vicinity of MMSD Northwest Side Relief Sewer (NWSRS)

Wells to be Monitored: GM-IR-10 (Well **884**) and GM-IR-11 (Well **885**)

Well Used To Calculate PALs: Not Applicable

Enforcement Standard Wells: Not Applicable

Parameter	Units	Preventative Action Limit	Enforcement Standard	Monitoring Frequency	Reporting Frequency
Depth To Groundwater	feet	*****	N/A	Daily	Monthly
Groundwater Elevation	feet MSL	*****	N/A	Daily	Monthly
Peak Hourly Volume of NWSRS	MG	N/A	N/A	Daily	Monthly
Nitrogen, Nitrite + Nitrate (as N) Dissolved	mg/L	2.0	10	Monthly – Per Occurrence	Monthly – Per Occurrence
Nitrogen, Ammonia Dissolved	mg/L	0.97	9.7	Monthly – Per Occurrence	Monthly – Per Occurrence
Total Coliform General	#/100 ml	0	0	Monthly – Per Occurrence	Monthly – Per Occurrence
Nitrogen, Organic Dissolved	mg/L	*****	N/A	Monthly – Per Occurrence	Monthly – Per Occurrence
Chloride, Dissolved	mg/L	125	250	Monthly – Per Occurrence	Monthly – Per Occurrence (See permit section 6.3.3)
Sulfate, Dissolved	mg/L	125	250	Monthly – Per Occurrence	Monthly – Per Occurrence (See permit section 6.3.3)

6.2.1.1 Changes from Previous Permit:

No changes from the previous permit.

6.2.1.2 Explanation of Limits and Monitoring Requirements

For the NWSRS, the permittee will perform groundwater quality analysis at all NWSRS monitoring wells for any wet weather event that causes the peak hourly volume in the NWSRS to be greater than or equal to 88 MG. This analysis includes monitoring for the following parameters listed in the table above; Nitrogen, Nitrite + Nitrate (as N) Dissolved, Nitrogen, Ammonia Dissolved, Total Coliform General, and Nitrogen, Organic Dissolved.

The Preventive Action Limits (PALs) and Enforcement Standards (ESs) for public health parameters are those established in ch. NR 140, Wis. Adm. Code. In the event public health parameter PALs are exceeded, then monitoring must continue monthly in addition to monitoring for public welfare parameters; dissolved chloride and dissolved sulfate. Public health parameters listed in the required monitoring table are Nitrogen Ammonia, Dissolved; Nitrogen Nitrite + Nitrate as N Dissolved; and Total Coliform.

6.2.2 Groundwater Monitoring System for GW Quality – Inline Storage System (ISS)

Location of Monitoring system: General vicinity of MMSD Inline Storage System (ISS)

Wells to be Monitored: CT-MW-04 (Well **805**), CT-MW-08 (Well **809**), CT-MW-09 (Well **810**), NS-MW-01 (Well **811**), NS-MW-02 (Well **812**), NS-MW-03 (Well **813**), NS-MW-04 (Well **814**), NS-MW-07 (Well **817**), NS-MW-10 (Well **824**), NS-MW-11 (Well **825**), KK-MW-01 (Well **826**), KK-MW-02 (Well **827**), KK-MW-03 (Well **828**), KK-MW-04 (Well **829**), LM-MW-01 (Well **830**), CT-MW-26 (Well **888**), NS-MW-19 (Well **889**), NS-MW-20 (Well **890**)

Well Used To Calculate PALs: Not Applicable

Enforcement Standard Wells: Not Applicable

PARAMETER	UNITS	PREVENTIVE ACTION LIMIT	ENFORCEMENT STANDARD	MONITORING FREQUENCY	REPORTING FREQUENCY
Depth To Groundwater	feet	*****	N/A	Daily	Monthly
Groundwater Elevation	feet MSL	*****	N/A	Daily	Monthly
Water Surface Elevation of Tunnel (PS0801)	feet MSL	*****	N/A	Daily	Monthly
Net Positive Head	feet	N/A	N/A	Daily	Monthly
Nitrogen, Nitrite + Nitrate (as N) Dissolved	mg/L	2.0	10	Monthly – Per Occurrence	Monthly – Per Occurrence
Nitrogen, Ammonia Dissolved	mg/L	0.97	9.7	Monthly – Per Occurrence	Monthly – Per Occurrence
Nitrogen, Ammonia Dissolved **(Well 812)**	mg/L	3.9 See section 6.3.3	9.7	Monthly – Per Occurrence	Monthly – Per Occurrence
Nitrogen, Ammonia Dissolved **(Well 817)**	mg/L	3.1 See section 6.3.3	9.7	Monthly – Per Occurrence	Monthly – Per Occurrence
Total Coliform General	#/100 ml	0	0	Monthly – Per Occurrence	Monthly – Per Occurrence
Nitrogen, Organic Dissolved	mg/L	*****	N/A	Monthly – Per Occurrence	Monthly – Per Occurrence
Chloride, Dissolved	mg/L	125	250	Monthly – Per Occurrence	Monthly – Per Occurrence (see permit section 6.3.3)
Sulfate, Dissolved	mg/L	125	250	Monthly – Per Occurrence	Monthly – Per Occurrence (see permit section 6.3.3)

6.2.2.1 Changes from Previous Permit

The following wells have been abandoned and thus removed from the permit: Well 819 and Well 823

6.2.2.2 Explanation of Limits and Monitoring Requirements

For the ISS, the permittee will perform groundwater quality analysis at all ISS monitoring wells for any wet weather event that causes the ISS fill elevation to exceed the piezometric head of wells in the system. This constitutes a loss of Net

Positive Head. This analysis includes monitoring for the following parameters listed in the table above; Nitrogen, Nitrite + Nitrate (as N) Dissolved, Nitrogen, Ammonia Dissolved, Total Coliform General, and Nitrogen, Organic Dissolved.

The Preventive Action Limits (PALs) and Enforcement Standards (ESs) for public health parameters are those established in ch. NR 140, Wis. Adm. Code. In the event public health parameter PALs are exceeded, then monitoring must continue monthly in addition to monitoring for public welfare parameters; dissolved chloride and dissolved sulfate. Public health parameters listed in the required monitoring table are Nitrogen Ammonia, Dissolved; Nitrogen Nitrite + Nitrate as N Dissolved; and Total Coliform.

7 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
005	B	Cake	Fecal Coliform	Volatile Solids Reduction	Land Application	1,107 dry U.S. tons
006	A	Pellets	Fecal Coliform and Temp/Time	Drying with Primary Solids	Produced for bagging and shipping	40,000 dry U.S. tons
008	A	Pellets	Fecal Coliform and Temp/Time	Drying with Primary Solids	Shipped to another facility for distribution/sale.	
009	A	Pellets	Fecal Coliform and Temp/Time	Drying with Primary Solids	Bagged for sale	
010	B	Cake	Does not land apply. Sludge is hauled to a landfill for disposal.			New sample point.
012	A	Pellets	Fecal Coliform and Temp/Time	Drying with Primary Solids	Bagged for sale	New sample point.
Does sludge management demonstrate compliance? **Yes.**						
Is additional sludge storage required? **No.**						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? **No.**						
Is a priority pollutant scan required? **Yes.** Priority pollutant scans are required at least once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and at least once every 5 years if design flow is greater than 40 MGD.						

7.1 Sample Point Number: 005 – South Shore Cake Sludge

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Arsenic Dry Wt	Ceiling	75 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Arsenic Dry Wt	High Quality	41 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Cadmium Dry Wt	Ceiling	85 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Cadmium Dry Wt	High Quality	39 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Copper Dry Wt	Ceiling	4,300 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Copper Dry Wt	High Quality	1,500 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Lead Dry Wt	Ceiling	840 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Lead Dry Wt	High Quality	300 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Mercury Dry Wt	Ceiling	57 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Mercury Dry Wt	High Quality	17 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Molybdenum Dry Wt	Ceiling	75 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Nickel Dry Wt	Ceiling	420 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Nickel Dry Wt	High Quality	420 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Selenium Dry Wt	Ceiling	100 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Selenium Dry Wt	High Quality	100 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Zinc Dry Wt	Ceiling	7,500 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Zinc Dry Wt	High Quality	2,800 mg/kg	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Nitrogen, Total Kjeldahl		Percent	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Nitrogen, Ammonium (NH4-N) Total		Percent	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Phosphorus, Total		Percent	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Phosphorus, Water Extractable		% of Tot P	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
Potassium, Total Recoverable		Percent	BiMonthly	Composite	See sections 7.2.1.1 and 7.2.1.2 of the permit.
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	See section 7.2.1.7 of the permit.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	See section 7.2.1.7 of the permit.
PFOA + PFOS		µg/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Permit Sections for more information.
PFAS Dry Wt		µg/kg	Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

7.1.1 Changes from Previous Permit:

PCB – Monitoring year updated.

PFAS – Monitoring is required annually pursuant to s. NR 204.06(2)(b)9, Wis. Adm. Code.

7.1.2 Explanation of Limits and Monitoring Requirements

The permittee is not required to analyze for Total Kjeldahl Nitrogen, Ammonium, Total Phosphorus, Water Extractable Phosphorus, Total Recoverable Potassium, pathogens, and vector attraction parameters unless land application of sludge is initiated. As long as landfilling is the sole disposal method, only List 1 analysis is required. The metals limits in the table above do not apply to landfilled sludge.

Requirements for disposal, including land application of municipal sludge, are determined in accordance with ch. NR 204, Wis. Adm. Code. Ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5), Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7), Wis. Adm. Code for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k), Wis. Adm. Code.

PFAS: The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA has developed a draft risk assessment to determine future land application rates and released this risk assessment in January of 2025. The Department is evaluating this new information. Until a decision is made, the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS" should be followed.

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department's implementation of EPA's recommendations. To quantitate this risk, PFAS sampling has been included in this WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9, Wis. Adm. Code.

7.2 Sample Point Number: 006 – Jones Island EQ Sludge – PRODUCTION

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Arsenic Dry Wt	High Quality	41 mg/kg	Monthly	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Monthly	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Monthly	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Monthly	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Monthly	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Monthly	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Monthly	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Monthly	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Zinc Dry Wt	High Quality	2,800 mg/kg	Monthly	Composite	
Nitrogen, Total Kjeldahl		Percent	Monthly	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Monthly	Composite	
Phosphorus, Total		Percent	Monthly	Composite	
Phosphorus, Water Extractable		% of Tot P	Monthly	Composite	
Potassium, Total Recoverable		Percent	Monthly	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Daily	Composite	See permit section 7.2.2.9.
PCB Total Dry Wt	High Quality	10 mg/kg	Daily	Composite	See permit section 7.2.2.9.
Solids, Total	Daily Min	90 Percent	2/Week	Composite	See permit section 7.2.2.1 for reporting requirements.
Fecal Coliform	Daily Max	1000 MPN/gTS	Weekly	Grab	See permit section 7.2.2.4 and List 3 in section 7.2.2.10.
Municipal Sludge Priority Pollutant Scan			2/Year	Composite	As specified in ss. NR 215.03 (1-4), Wis. Adm. Code
PFOA + PFOS		µg/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt		µg/kg	Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

7.2.1 Changes from Previous Permit:

PCB – Monitoring year updated.

PFAS – Monitoring is required annually pursuant to s. NR 204.06(2)(b)9, Wis. Adm. Code.

7.2.2 Explanation of Limits and Monitoring Requirements

Requirements for disposal, including land application of municipal sludge, are determined in accordance with ch. NR 204, Wis. Adm. Code. Ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5), Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7), Wis. Adm. Code for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k), Wis. Adm. Code. In order to comply with Class A biosolids requirements the facility submitted plans for approval to use temp/time as the process to demonstrate compliance with the pathogen control requirements as specified in s. NR 204.07, Wis. Adm. Code, and 40 CFR 503.

PFAS: The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA has developed a draft risk assessment to determine future land application rates and released this risk assessment in January of

2025. The Department is evaluating this new information. Until a decision is made, the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS" should be followed.

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department's implementation of EPA's recommendations. To quantitate this risk, PFAS sampling has been included in this WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9, Wis. Adm. Code.

7.3 Sample Point Number: 008 – Jones Island EQ Sludge – SHIPPING

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Weight		tons/day	Monthly	Estimated	Maintain a daily log of un-bagged EQ sludge transferred from on-site storage prior to shipping. Report tons/day as a monthly average on the monthly forms.
Solids, Total	Daily Min	90 Percent	Monthly	Grab	See section 7.2.3.1 of the permit.
Fecal Coliform	Daily Max	1,000 MPN/g TS	Monthly	Grab	See section 7.2.3.2 of the permit.

7.3.1 Changes from Previous Permit:

No changes from the previous permit.

7.3.2 Explanation of Limits and Monitoring Requirements

Requirements for municipal sludge are determined in accordance with ch. NR 204 Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7), Wis. Adm. Code, for vector attraction requirements. The limits and monitoring requirements for Sample Point 008 are included in accordance with both state and federal for pathogen and vector attraction requirements.

7.4 Sample Point Number: 009 & 012 – Jones Island EQ Sludge – BAGGING

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Weight		tons/day	Monthly	Estimated	Maintain a daily log of un-bagged EQ sludge transported from on-site storage to bagging facility in Milwaukee. Report tons/day as a monthly average on the monthly forms.
Solids, Total	Daily Min	90 Percent	Monthly	Grab	See section 7.2.4.1 of the permit.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Fecal Coliform	Daily Max	1,000 MPN/g TS	Monthly	Grab	See section 7.2.4.2 of the permit.

7.4.1 Changes from Previous Permit:

Sample point 012 was added with the same monitoring requirements and limitations to reflect the two different bagging locations.

No changes to sample point 009 from previous permit.

7.4.2 Explanation of Limits and Monitoring Requirements

Requirements for municipal sludge are determined in accordance with ch. NR 204 Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7), Wis. Adm. Code, for vector attraction requirements. The limits and monitoring requirements for Sample Point 009 and 012 are included in accordance with both state and federal requirements for pathogen and vector attraction.

7.5 Sample Point Number: 010 – Jones Island Filter Press Cake Sludge

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Annual	Composite	See section 7.2.5.1 of the permit.
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	See section 7.2.5.1 of the permit.
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	See section 7.2.5.1 of the permit.
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	See section 7.2.5.1 of the permit.
Phosphorus, Total		Percent	Annual	Composite	See section 7.2.5.1 of the permit.
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	See section 7.2.5.1 of the permit.
Potassium, Total Recoverable		Percent	Annual	Composite	See section 7.2.5.1 of the permit.
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	See sections 7.2.5.1 and 7.2.5.6 of the permit.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	See sections 7.2.5.1 and 7.2.5.6 of the permit.
PFOA + PFOS		µg/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt		µg/kg	Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

7.5.1 Changes from Previous Permit:

PCB – Monitoring year updated.

PFAS – Monitoring is required annually pursuant to s. NR 204.06(2)(b)9, Wis. Adm. Code.

7.5.2 Explanation of Limits and Monitoring Requirements

The permittee is not required to analyze for Total Kjeldahl Nitrogen, Ammonium, Total Phosphorus, Water Extractable Phosphorus, Total Recoverable Potassium, pathogens, and vector attraction parameters unless land application of sludge is initiated. As long as landfilling is the sole disposal method, only List 1 analysis is required. The metals limits in the table

above do not apply to landfilled sludge. Monitoring for landfilled sludge may remain at Annual as long as that is the sole method of disposal. If sludge is land applied the sample frequency may increase based on the amount of sludge generated in accordance with Table A in s. NR 204.06, Wis. Adm. Code, and all limits and monitoring requirements listed in the table apply.

Requirements for disposal, including land application of municipal sludge, are determined in accordance with ch. NR 204, Wis. Adm. Code. Ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5), Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7), Wis. Adm. Code for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k), Wis. Adm. Code.

PFAS: The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA has developed a draft risk assessment to determine future land application rates and released this risk assessment in January of 2025. The Department is evaluating this new information. Until a decision is made, the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS" should be followed.

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department's implementation of EPA's recommendations. To quantitate this risk, PFAS sampling has been included in this WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9, Wis. Adm. Code.

8 Schedules

8.1 Surface Water Intake

No later than 14 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance with the required action. Timely submittal fulfills the written notification requirement.

Required Action	Due Date
Annual Intake Flow Report: The permittee shall submit a report of the annual intake flow from the water intake structure, as specified in section 2.2.1.2.	01/31/2027
Annual Intake Flow Report: The permittee shall submit a report of the annual intake flow from the water intake structure, as specified in section 2.2.1.2.	01/31/2028
Annual Intake Flow Report: The permittee shall submit a report of the annual intake flow from the water intake structure, as specified in section 2.2.1.2.	01/31/2029
Annual Intake Flow Report: The permittee shall submit a report of the annual intake flow from the water intake structure, as specified in section 2.2.1.2.	01/31/2030
Annual Intake Flow Report: The permittee shall submit a report of the annual intake flow from the water intake structure, as specified in section 2.2.1.2.	01/31/2031
Annual Intake Flow Reports After Permit Expiration: In the event this permit is not reissued by the expiration date, the permittee shall continue to submit annual reports by January 31st.	

8.1.1 Explanation of Schedule

Surface Water Intake

As specified in Section 2.2.1.2 of the permit, an annual actual intake flow report is due each year no later than January 31st. This report should document the actual intake flow for the previous year and the percentage of withdrawn water used exclusively for cooling purposes. This report is to demonstrate each year that ch. NR 111, Wis. Adm. Code does not apply to the intake structure.

8.2 Surface Water Quality Monitoring Reports

The permittee's ongoing surface water quality monitoring program described in the most recent Surface Water Quality Monitoring plan will be used to track water quality through the permit term.

Required Action	Due Date
Annual Report: The permittee shall submit a report of the monitoring results from the previous year, as described in the most recent monitoring plan.	06/30/2027
Annual Report #2: Submit a report of the monitoring results from the previous year, as described in the monitoring plan.	06/30/2028
Annual Report #3: Submit a report of the monitoring results from the previous year, as described in the monitoring plan.	06/30/2029
Annual Report #4: Submit a report of the monitoring results from the previous year, as described in the monitoring plan.	06/30/2030
Annual Report #5: Submit a report of the monitoring results from the previous year, as described in the monitoring plan.	06/30/2031
Annual Reports After Permit Expiration: In the event this permit is not reissued by the expiration date, the permittee shall continue to submit annual reports by June 30th.	

8.2.1 Explanation of Schedule

Surface Water Quality Monitoring Plan

The permittee's ongoing surface water quality monitoring program described in the most recent Surface Water Quality Monitoring Plan is used to track water quality throughout the permit term. The permittee shall provide annual reports of monitoring results by June 30th of the following year as described in the monitoring plan and in accordance with section 4.3.5.2 of the permit. The schedule is included in the permit so the Department and permittee can track the progress of the program and ensure timely report submittal.

8.3 Wet Weather Management

Required Action	Due Date
Submit Biannual Progress Report #1: The permittee shall submit to the Department a biannual progress report summarizing the wet weather management projects and initiatives implemented in the previous two permit years. The report shall summarize the green infrastructure practices and control measures that were put in place and provide data analysis on the total retention capacity added for the year.	03/31/2027
Submit Biannual Progress Report #2: The permittee shall submit to the Department the second biannual report on the progress of implementing the selected wet weather management projects. Submittal of the second biannual progress report is required by the Date Due.	03/31/2029
Submit Final Report: The permittee shall submit to the Department the final report on the progress of implementing the selected wet weather management projects during the permit term. The report should provide a summary of the total retention capacity added during the permit term and propose new targets for implementation in the next permit term.	03/31/2030

Biannual Progress Reports After Permit Expiration: In the event this permit is not reissued by the expiration date, the permittee shall continue to submit biannual progress reports by March 31st in odd years.	

8.3.1 Explanation of Schedule

Wet Weather Management

In order to meet the CSO performance standards outlined in section 4.3.5 of the permit the permittee shall implement wet weather management programs. The permittee shall provide annual reports documenting the implementation of the programs required of section 4.3.5.3 by March 31st. These reports shall identify the actions taken in the previous two years as outlined in above schedule. The schedule is included in the permit so the Department and permittee can track the progress of the program and ensure timely report submittal.

8.4 Mercury Pollutant Minimization Program

As a condition of the mixing zone phase out exception for mercury granted in accordance with s. NR 106.06(2)(br), Wis. Adm. Code, and 40 CFR 132, Appendix F, the permittee shall perform the following actions in accordance with s. NR 106.145, Wis. Adm. Code.

Required Action	Due Date
Submit Annual Status Reports: The permittee shall submit to the Department an annual status report to summarize and evaluate mercury monitoring data and other relevant information collected to document background and effluent levels of mercury. The report shall also document any continuing reasonable cost-effective efforts to identify and reduce potential sources of mercury in the effluent. The first annual report shall be due on the date specified and annually thereafter.	09/30/2027
Submit Annual Status Report #2: The permittee shall submit to the Department the second annual status report on the progress of the PMP. Submittal of the second annual status report is required by the Date Due.	09/30/2028
Submit Annual Status Report #3: The permittee shall submit to the Department the third annual status report on the progress of the PMP. Submittal of the third annual status report is required by the Date Due.	09/30/2029
Submit Annual Status Report #4: The permittee shall submit to the Department the fourth annual status report on the progress of the PMP. Submittal of the fourth annual status report is required by the Date Due.	09/30/2030
Final Status Report: Submit a final report documenting the success in reducing or maintaining mercury concentrations in the effluent. The report shall summarize mercury pollutant minimization activities that have been implemented during the current permit term. The report shall include an analysis of trends in monthly and annual total effluent mercury concentrations based on mercury sampling during the current permit term. The report shall also include an analysis of how influent and effluent mercury varies with time and with significant loading of mercury such as loads from industries into the collection system. Note: If the permittee wishes to apply for an alternative mercury effluent limitation in the next permit, that application is due with the application for permit reissuance, 6 months prior to permit expiration. The permittee should submit or reference the PMP plan as updated by the Annual Status Report or more recent developments as part of that application.	09/30/2031
Annual Reports After Permit Expiration: In the event this permit is not reissued by the expiration date, the permittee shall continue to submit annual mercury status reports by September 30th.	

8.4.1 Explanation of Schedule

Mercury Pollutant Minimization Program

The permittee has requested an exception to the proposed mixing zone phase-out when calculating effluent limitations for mercury beyond the November 15, 2010 phase-out date under the exception for technical and economic considerations to the mixing zone phase-out for bio-accumulating chemicals of concern (BCC's) at 40 CFR, Part 132, Appendix F, Procedure 3 C. 6. Therefore, the permittee will accept a permit requirement for a continued mercury PMP that meets the requirements of s. 106.145(7), Wis. Adm. Code. WDNR believes that the finding at s.106.145(1)(a), Wis. Adm. Code, sufficiently demonstrates that controls beyond a PMP would result in unreasonable economic effects because controls to remove mercury using wastewater treatment technology are not feasible or cost-effective.

Note: The granting of this exception shall only apply to the 5-year term of the WPDES permit. The permittee will need to make a similar request and WDNR will need to make a similar determination for a further continuation of a mixing zone if those actions become appropriate for the next permit term.

8.5 Arsenic Pollutant Minimization Program

Required Action	Due Date
Annual Arsenic Progress Reports: Submit an annual arsenic progress report related to the pollutant minimization activities for the previous year. The annual arsenic progress report shall: Indicate which arsenic pollutant minimization activities or activities outlined in the Pollutant Minimization Program Plan have been implemented and state which, if any, activities from the Pollutant Minimization Program Plan were not pursued and why; Include an assessment of whether each implemented pollutant minimization activity appears to be effective or ineffective at reducing pollutant discharge concentrations and identify actions planned for the upcoming year; Identification of barriers that have limited program effectiveness and adjustments to the program that will be implemented during the next year to help address these barriers; Include an analysis of trends in total effluent arsenic concentrations based on arsenic sampling; and Include an analysis of how influent and effluent arsenic varies with time and with significant loading of arsenic. The first annual arsenic progress report is to be submitted by the Due Date.	01/31/2027
Annual Arsenic Progress Report #2: Submit an arsenic progress report, related to the pollutant minimization activities for the previous year, as defined above.	01/31/2028
Annual Arsenic Progress Report #3: Submit an arsenic progress report, related to the pollutant minimization activities for the previous year, as defined above.	01/31/2029
Annual Arsenic Progress Report #4: Submit an arsenic progress report, related to the pollutant minimization activities for the previous year, as defined above.	01/31/2030
Final Arsenic Report: Submit a final report documenting the success in reducing arsenic concentrations in the effluent, as well as the anticipated future reduction in arsenic sources and arsenic effluent concentrations. The report shall:	12/31/2030

Summarize arsenic pollutant minimization activities that have been implemented during the current permit term and state which, if any, activities from the Pollutant Minimization Program Plan were not pursued and why; Include an assessment of which pollutant minimization activities appear to have been effective or ineffective. Evaluate any needed changes to the pollutant reduction strategy accordingly; Identification of barriers that have limited program effectiveness and adjustments to the program that will be implemented during the next variance term (if applicable) to help address these barriers; Include an analysis of trends in arsenic concentrations based on sampling and data during the current permit term; and Include an analysis of how influent and effluent arsenic varies with time and with significant loadings of arsenic. If the permittee intends to reapply for an arsenic variance per s. 283.15, Wis. Stats, for the reissued permit, a detailed Pollutant Minimization Program Plan outlining the pollutant minimization activities proposed for the upcoming permit term shall be submitted along with the final report. An updated pollutant minimization plan shall: Include an explanation of why or how each pollutant minimization activity will result in reduced discharge of the target pollutant; Evaluate any new available information on pollutant sources, timing, and concentration to update the mass balance assumptions and expected sources of the pollutant; and Identify any information needs that would help to better determine pollutant sources and make plans to collect that information.	
Annual Arsenic Reports After Permit Expiration: In the event that this permit is not reissued by the date the permit expires, the permittee shall continue to submit annual arsenic reports for the previous year following the due date of Annual Arsenic Progress Reports listed above. Annual Arsenic Progress reports shall include the information as defined above.	

8.5.1 Explanation of Schedule

Arsenic Pollutant Minimization Program

This schedule is required to ensure that the permittee maintains compliance with the conditions and requirements of receiving a variance from the water quality standard for arsenic. Since a compliance schedule is being granted, an interim limit is required, and for MMSD the limit is established as 1.5 ug/L (as a daily maximum). The schedule requires that annual reports shall indicate which pollutant minimization measures MMSD has implemented during each calendar year and an analysis of arsenic concentration data based on sampling. The annual reports shall document progress made towards meeting the arsenic effluent limit by the end of the permit term.

8.6 Effluent Limitations for E. coli (Outfalls 001 and 002)

Required Action	Due Date
Final Plans and Specifications: The permittee shall submit final construction plans to the Department for approval pursuant to ch. NR 108, Wis. Adm. Code, specifying treatment plant upgrades that must be constructed to achieve compliance with final *E. coli* limitations and a schedule for completing construction of the upgrades by the complete construction date specified below.	06/30/2027
Treatment Plant Upgrade to Meet Limitations: The permittee shall initiate bidding, procurement, and/or construction of the project. The permittee shall obtain approval of the final construction plans	06/30/2028

and schedule from the Department pursuant to s. 281.41. Stats., prior to initiating activities defined as construction under ch. NR 108, Wis. Adm. Code. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications.	
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	06/30/2029
Construction Upgrade Progress Report #2: The permittee shall submit a progress report on construction upgrades.	06/30/2030
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	03/31/2031
Achieve Compliance: The permittee shall achieve compliance with final *E. coli* limitations.	05/01/2031

8.6.1 Explanation of Schedule

Effluent Limitations for E. coli (Outfalls 001 and 002)

A compliance schedule is included in the permit to provide time for the permittee to investigate options for meeting new effluent E. coli water quality-based effluent limits while coming into compliance with the limits as soon as reasonably possible.

8.7 PFOS/PFOA Minimization Plan Determination of Need (Outfalls 001 and 002)

Required Action	Due Date
Report on Effluent Discharge: Submit a report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations. This analysis should also include a comparison to the applicable narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results.	09/30/2027
Report on Effluent Discharge and Evaluation of Need: Submit a final report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations of data collected over the last 24 months. The report shall also provide a comparison on the likelihood of the facility needing to develop a PFOS/PFOA minimization plan. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results. The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan. If the department determines a PFOS/PFOA minimization plan is needed based on a reasonable potential evaluation, the permittee will be required to develop a minimization plan for department approval no later than 90 days after written notification was sent from the department. The department will modify or revoke and reissue the permit to include PFOS/PFOA minimization plan reporting requirements along with a schedule of compliance to meet WQBELs. Effluent monitoring of PFOS and PFOA shall continue as specified in the permit until the modified permit is issued. If, however, the department determines there is no reasonable potential for the facility to discharge PFOS or PFOA above the narrative standard in s. NR 102.04(8)(d), Wis. Adm.	09/30/2028

Code, no further action is required and effluent monitoring of PFOS and PFOA shall continue as specified in the permit.	

8.7.1 Explanation of Schedule

PFOS/PFOA Minimization Plan Determination of Need (Outfalls 001 and 002)

As stated above, ch. NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. Section NR 106.98, Wis. Adm. Code, specifies steps to generate data in order to determine the need for reducing PFOS and PFOA in the discharge. Data generated per the effluent monitoring requirements will be used to determine the need for developing a PFOS/PFOA minimization plan. As part of the schedule, the permittee is required to submit two annual Reports on Effluent Discharge.

If the Department determines that a minimization plan is needed, the permit will be modified or revoked/reissued to include additional requirements.

8.8 Biosolids Management Plan

An updated management plan is required for the biosolids handling and processing systems, as described below.

Required Action	Due Date
Biosolids Management Plan Submittal: Submit an updated management plan, to the Department for review and approval, detailing system controls, operations and maintenance procedures, and compliance monitoring and reporting for biosolids production at each active land application outfall and/or distribution outfall listed in section 7 of the permit. This management plan shall include in sufficient detail; 1) a description of how the pathogen requirements are met including the locations specifying the where the organism density monitoring is completed, the methods used for analyses including hold times and sample collection, the pathogen treatment process including monitoring procedures and locations of monitoring equipment, data collection, and other data to support appropriate pathogen treatment; 2) a description of how the vector attraction reduction requirements are met; 3) an updated laboratory quality assurance and control plan consistent with 40 CFR 503.8; 4) monitoring procedures; 5) a contingency plan for equipment breakdown and/or maintenance and repair; 6) a contingency plan for handling Class A biosolids material that does not meet the Class A requirements specified in ch. NR 204, Wis. Adm. Code, and 40 CFR part 503 specifically as they relate to pathogen control and vector attraction requirements; and 7) any other pertinent information. Any changes to the plan must be approved by the Department prior to implementing the changes.	07/31/2027

8.8.1 Explanation of Schedule

Biosolids Management Plan

The update to the management plan is being required to optimize the permittee's biosolids handling processes and assure compliance with ch. NR 204, Wis. Adm. Code and 40 CFR Part 503.

8.9 Biosolids Daily Logs

Required Action	Due Date
Daily Log Annual Report Submittal #1: Submit to the Department in electronic spreadsheet form, the applicable information as described in sections 7.2.2.2 and 7.2.2.3 for heat drying and time-	01/31/2027

temperature requirements. The daily logs shall be submitted by January 31 for the previous calendar year.	
Daily Log Annual Report Submittal #2: Submit to the Department in electronic spreadsheet form, the applicable information as described in sections 7.2.2.2 and 7.2.2.3 for heat drying and time-temperature requirements. The daily logs shall be submitted by January 31 for the previous calendar year.	01/31/2028
Daily Log Annual Report Submittal #3: Submit to the Department in electronic spreadsheet form, the applicable information as described in sections 7.2.2.2 and 7.2.2.3 for heat drying and time-temperature requirements. The daily logs shall be submitted by January 31 for the previous calendar year.	01/31/2029
Daily Log Annual Report Submittal #4: Submit to the Department in electronic spreadsheet form, the applicable information as described in sections 7.2.2.2 and 7.2.2.3 for heat drying and time-temperature requirements. The daily logs shall be submitted by January 31 for the previous calendar year.	01/31/2030
Daily Log Annual Report Submittal #5: Submit to the Department in electronic spreadsheet form, the applicable information as described in sections 7.2.2.2 and 7.2.2.3 for heat drying and time-temperature requirements. The daily logs shall be submitted by January 31 for the previous calendar year.	01/31/2031
Daily Log Annual Reports After Permit Expiration: In the event this permit is not reissued by the expiration date, the permittee shall continue to submit daily log annual reports by January 31st.	

8.9.1 Explanation of Schedule

Biosolids Daily Logs

Daily logs are required to be submitted to the Department by January 31st every year. The logs shall be submitted in electronic spreadsheet form and include the applicable information as described in permit sections 7.2.2.2 and 7.2.2.3 for heat drying and time-temperature requirements.

Other Comments:

None

Attachments:

Water Quality Based Effluent Limits – dated April 17, 2024, updated September 02, 2025 and prepared by Nicole Krueger, WDNR Water Resources Engineer

NR 140 Groundwater Evaluation Report – dated October 4, 2023 and prepared by Zach Watson, WDNR Hydrogeologist

Arsenic Variance EPA Data Sheet

Arsenic Pollutant Minimization Plan, MMSD dated May 2026

Bacteria/CSO Variance Justification Memo

Bacteria/CSO Pollutant Minimization Plan, MMSD dated May 2026

Expiration Date:

September 30, 2031

Justification of Any Waivers from Permit Application Requirements

The Department's electronic application program automatically generates a list of parameters the permittee is required to sample for based on the classification of the discharge. Because the system only allows one classification to be entered, municipal monitoring requirements were included in the permit application for Outfall 003, which is 100% non-contact cooling water. Therefore, the permittee was only required to test for the following parameters; Chloride, mg/L (16887-00-6), pH Field, s.u., and Suspended Solids, Total, mg/L at Outfall 003. Due to the discontinuing of Outfall 003, this won't be a factor as part of the next permit application.

Prepared By:

Amy Garbe, P.E. – Wastewater Engineer

Date: January 23, 2026

Updated Date (post fact check): June 1, 2026

Updated Date (post public notice):

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: 04/17/2024 updated 09/02/2025

TO: Amy Garbe – WY/3

FROM: Nicole Krueger – SER Nicole Krueger

SUBJECT: Water Quality-Based Effluent Limitations for Milwaukee Metropolitan Sewerage District Combined
WPDES Permit No. WI-0036820-05

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from Milwaukee Metropolitan Sewerage District Combined in Milwaukee County. This municipal wastewater treatment facility (WWTF) discharges to Lake Michigan. The Jones Island discharge is included in the Milwaukee River Basin TMDL as approved by EPA. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis:

Outfall 001: South Shore Effluent

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5			45 mg/L	30 mg/L		1
TSS			45 mg/L	30 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Ammonia Nitrogen Nov – April			27 mg/L	**27 mg/L**		3,4
Residual Chlorine	38 µg/L		36 µg/L	**36 µg/L**		1,3
Bacteria						5
Interim Limit Fecal Coliform				400 #/100 mL geometric mean		
Final Limit *E. coli*				126 #/100 mL geometric mean		
Phosphorus				1.0 mg/L	0.6 mg/L	
Arsenic				0.2 µg/L		6
Cadmium						1,2
Copper						1,2
Lead						1,2
Nickel						1,2
Zinc						1,2
Mercury	3.7 ng/L					7
Acute WET						8,9
Chronic WET						8,9
Temperature						1,2

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
TKN, Nitrate+Nitrite, and Total Nitrogen						10
PFOS and PFOA						11

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. Limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
4. Monitoring only for ammonia during May – October.
5. Bacteria limits apply year-round. Final E. coli limits will become effective during the recreational season (May-October) at the end of the compliance schedule. Either fecal coliform or E. coli limits may apply during the non-recreational season. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
6. This is the WQBEL for arsenic. If this limit is included in the permit, mass limits would also need to be included. A variance limit of 1.5 µg/L as a daily maximum, equal to the 1-day P_{99} of representative data, may be included in the permit in place of the WQBEL if an arsenic variance is approved by EPA.
7. Due to technical and economic considerations, the Department granted a mixing zone phase-out exception for mercury, with the daily maximum limit equal to the 1-day P_{99} of 3.7 ng/L.
8. Annual acute and chronic WET testing is recommended. The Instream Waste Concentration (IWC) to assess chronic test results is 9%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 30%, 10%, 3% & 1% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from Lake Michigan.
9. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).
10. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen monitoring is recommended for all municipal major permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (TKN) (all expressed as N).
11. Monitoring is required in accordance with s. NR 106.98(2), Wis. Adm. Code at a monthly frequency.

Outfall 002 – Jones Island Effluent

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5			45 mg/L	30 mg/L		1
TSS			45 mg/L	30 mg/L		1,3
pH	9.0 s.u.	6.0 s.u.				1
Ammonia Nitrogen						1,2
Residual Chlorine	38 µg/L		36 µg/L	**36 µg/L**		1,4
Bacteria						5

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Interim Limit Fecal Coliform				400 #/100 mL geometric mean		
Final Limit *E. coli*				126 #/100 mL geometric mean		
Phosphorus				0.66 mg/L		1,3
Arsenic						1,2
Cadmium						1,2
Copper						1,2
Lead						1,2
Nickel						1,2
Zinc						1,2
Mercury	4.1 ng/L					6
Acute WET						7,8
Chronic WET						7,8
Temperature						1,2
TKN, Nitrate+Nitrite, and Total Nitrogen						9
PFOS and PFOA						10

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. The TSS and phosphorus mass limits shown below are based on the Total Maximum Daily Load (TMDL) for the Milwaukee River Basin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA in March 2018.

Month	**Weekly Ave TSS Effluent Limit (lbs/day)**	**Monthly Ave TSS Effluent Limit (lbs/day)**	**Monthly Average TP Effluent Limit (lbs/day)**
Jan	51,332	30,195	664
Feb	56,832	33,430	735
Mar	51,332	30,195	664
Apr	53,043	31,202	686
May	51,332	30,195	664
Jun	53,043	31,202	686
Jul	51,332	30,195	664
Aug	51,332	30,195	664
Sep	53,043	31,202	686
Oct	51,332	30,195	664
Nov	53,043	31,202	686
Dec	51,332	30,195	664

4. Limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
5. Bacteria limits apply year round. The fecal coliform interim limit will apply until the end of the compliance schedule when *E. coli* limits take effect. Additional final limit: No more than 10

percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.

6. Due to technical and economic considerations, the Department granted a mixing zone phase-out exception for mercury, with the daily maximum limit equal to the current 1-day P_{99} of 4.1 ng/L.
7. Annual acute and chronic WET testing is recommended. The Instream Waste Concentration (IWC) to assess chronic test results is 20%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 30%, 10%, 3% & 1% and the dilution water used in WET tests conducted on Outfall 002 shall be a grab sample collected from Lake Michigan.
8. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).
9. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen monitoring is recommended for all municipal major permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (TKN) (all expressed as N).
10. Monitoring is required in accordance with s. NR 106.98(2), Wis. Adm. Code at a monthly frequency.

Continued monitoring for total recoverable cadmium, chromium, copper, lead, nickel and zinc is required because Milwaukee Metropolitan operates a local pretreatment program for the many industries that discharge to the treatment facility.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nicole Krueger at Nicole.Krueger@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (3) – Narrative, Outfall Maps, & Thermal Table

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Attachment #1

Water Quality-Based Effluent Limitations for Milwaukee Metropolitan Sewerage District Combined

WPDES Permit No. WI-0036820-05

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description

The Milwaukee Metropolitan Sewerage District is a state chartered, government agency providing wastewater treatment services for 28 municipalities and 1.1 million people. The District's service area includes all cities and villages, (except the City of South Milwaukee), within Milwaukee County and all or part of 10 municipalities in the surrounding counties of Ozaukee, Washington, Waukesha and Racine. Approximately 3,000 miles of community-owned sewers lead to a 310-mile system of intercepting sewers that convey sewage to the Jones Island and South Shore water reclamation facilities (WRFs). Both WRFs provide secondary treatment of residential, commercial and industrial wastewater. See descriptions for Outfall 001, 002, and 003 below. Approximately 7% of the total sewer service area has combined sewers which serve portions of the City of Milwaukee and the Village of Shorewood. As a result, tributary flows can exceed 1 billion gallons per day during major storm events. Therefore, an Inline Storage System (ISS) or "deep tunnel" is used to store excess volumes and reduce the risk of combined and sanitary sewer overflows. The deep tunnel was originally completed in 1993 and was later expanded in 2005 and 2010 to the present storage capacity of 521 million gallons. The system enables the District to collect, store and convey the increased sewage volumes associated with storm events to either or both WRF.

Outfall 001 - South Shore Water Reclamation Facility (SSWRF) is located approximately 10 miles south of the Jones Island Water Reclamation Facility, along the Lake Michigan shore in Oak Creek. At, SSWRF, the liquid wastes treatment train consists of fine screening, grit removal, primary clarification, activated sludge aeration, secondary clarification, chlorination and dechlorination. Iron (ferric chloride, ferrous chloride, or ferrous sulfate) is added between preliminary and primary treatment for chemical phosphorus removal. Effluent is discharged through a 4-port diffuser located 1,200 feet east from the north end of the facility into Lake Michigan. Anaerobic sludge digestion produces methane gas and fuels large generators which produce over half of the electricity needed for SSWRF's treatment processes.

Outfall 002 - Jones Island Water Reclamation Facility (JIWRF) is located in the center of the sewer service area in the Milwaukee Harbor. At JIWRF, the liquid wastes treatment train consists of fine screening, grit removal, primary clarification, incidental biological phosphorus removal, ferric addition as a polish, activated sludge aeration, secondary clarification, chlorination and dechlorination. Effluent is discharged through Outfall 002 at the northeast corner of Jones Island to the Milwaukee Outer Harbor on Lake Michigan.

The current permit includes Outfall 003 which contains noncontact cooling water (NCCW) from Jones Island. Since January 2023, the NCCW has been rerouted to preliminary treatment, so this outfall has been inactive and will not be evaluated in this memo.

Attachment #2 is a map of the area showing the approximate location of Outfalls 001 and 002.

Existing Permit Limitations
The current permit, expiring on 03/31/2024, includes the following effluent limitations and monitoring requirements.

Outfall 001 – South Shore Effluent

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD_5			45 mg/L	30 mg/L		2
TSS			45 mg/L	30 mg/L		2
pH	9.0 s.u.	6.0 s.u.				2
Ammonia Nitrogen Nov – April			27 mg/L	**27 mg/L**		3
Residual Chlorine	38 µg/L		36 mg/L	**36 mg/L**		3
Fecal Coliform			**972#/100 mL geometric mean**	400#/100 mL geometric mean		3
E. coli						1
Phosphorus				1.0 mg/L	0.7 mg/L	
Arsenic						4
Cadmium						4
Copper						4
Lead						4
Nickel						4
Zinc						4
Mercury	4.1 ng/L					5
Acute WET						6
Chronic WET						6
Temperature						1

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
3. Limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
4. Monitoring for total recoverable cadmium, chromium, copper, lead, nickel and zinc is required because Milwaukee Metropolitan operates a local pretreatment program for the many industries that discharge to the treatment facility.
5. This is a mixing zone phase-out exception limit.
6. Acute and chronic WET tests are required 1x/annually. The IWC for chronic WET was 9%.

Outfall 002 – Jones Island Effluent

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD_5			45 mg/L	30 mg/L		2
TSS			45 mg/L	30 mg/L		3
pH	9.0 s.u.	6.0 s.u.				2
Ammonia Nitrogen						1
Residual Chlorine	38 µg/L		36 mg/L	**36 mg/L**		4
Fecal Coliform			**972#/100 mL geometric mean**	400#/100 mL geometric mean		4
E. coli						1
Phosphorus				0.66 mg/L		3
Arsenic						5
Cadmium						5
Copper						5
Lead						5
Nickel						5
Zinc						5
Mercury	4.6 ng/L					6
Acute WET						7
Chronic WET						7
Temperature						1

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
3. TSS and phosphorus mass limitations from the Milwaukee River TMDL are shown below.

Month	Weekly Average TSS Effluent Limit (lbs/day)	Monthly Average TSS Effluent Limit (lbs/day)	Monthly Average TP Effluent Limit (lbs/day)
Jan	51,332	30,195	664
Feb	56,832	33,430	735
Mar	51,332	30,195	664
Apr	53,043	31,202	686
May	51,332	30,195	664
Jun	53,043	31,202	686
Jul	51,332	30,195	664
Aug	51,332	30,195	664
Sep	53,043	31,202	686
Oct	51,332	30,195	664

Attachment #1

Month	Weekly Average TSS Effluent Limit (lbs/day)	Monthly Average TSS Effluent Limit (lbs/day)	Monthly Average TP Effluent Limit (lbs/day)
Nov	53,043	31,202	686
Dec	51,332	30,195	664

4. Limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
5. Monitoring for total recoverable cadmium, chromium, copper, lead, nickel and zinc is required because Milwaukee Metropolitan operates a local pretreatment program for the many industries that discharge to the treatment facility.
6. This is a mixing zone phase-out exception limit.
7. Acute and chronic WET tests are required 1x/annually. The IWC for chronic WET was 20%.

Receiving Water Information

- Name: Lake Michigan
- Waterbody Identification Code (WBIC): 20
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Coldwater community, public water supply.
- Flow: A ten-to-one dilution ratio will be used for calculating effluent limitations based on chronic or long-term impacts, in accordance with s. NR 106.06(4)(b)2, Wis. Adm. Code, because the receiving water does not exhibit a unidirectional flow at the point of discharge for Outfall 001. A four-to-one dilution ratio will be used for Outfall 002 because the receiving water does not exhibit a unidirectional flow at the point of discharge. This dilution ratio has historically been used for this outfall for limit determinations.
- Hardness = 131 mg/L as $CaCO_3$. This value represents the geometric mean of data from chronic WET tests from 09/10/2020 – 06/22/2021.
- Source of background concentration data: Metals data from Lake Michigan is used for this evaluation. Mercury and arsenic data from sampling point 142 (city water intake). Other metals background is from Station ID 10052857 (Milwaukee Metropolitan Sewerage District Water Quality Data). The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: There are several other dischargers to Lake Michigan, however they are not in the immediate vicinity and the mixing zones do not overlap. Therefore, the other dischargers do not impact this evaluation.
- Impaired water status: Lake Michigan is 303(d) listed as impaired for mercury and PCBs at the discharge location.

Effluent Information

- Design flow rate(s):

  Outfall 001
  Annual average = 113 MGD (Million Gallons per Day)
  Peak daily = 265 MGD
  Peak weekly = 190 MGD
  Peak monthly = 170 MGD

Outfall 002

Annual average = 123 MGD (Million Gallons per Day)
Peak daily = 310 MGD
Peak weekly = 190 MGD
Peak monthly = 164 MGD

For reference, the actual average flow from 04/01/2019 – 03/31/2025 were:
Outfall 001: 87.2 MGD
Outfall 002: 103 MGD

- Hardness:
  Outfall 001: 365 mg/L as $CaCO_3$. This value represents the geometric mean of data from the permit reissuance application from 04/06/2023 – 04/18/2023.
  Outfall 002: 296 mg/L as $CaCO_3$. This value represents the geometric mean of data from the permit reissuance application from 04/06/2023 – 04/18/2023.

- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with water supply from Lake Michigan with industrial wastewater from 66 categorical and 79 significant industrial users.

- Additives:
  Outfall 001: Ferric chloride and ferrous chloride is used for phosphorus removal, sodium hypochlorite is used for disinfection, and sodium bisulfite is used for dechlorination
  Outfall 002: Ferric chloride is used for odor control, sodium hypochlorite is used for disinfection, and sodium bisulfite is used for dechlorination

- Effluent characterization: This facility is categorized as a major municipal, so the permit application required effluent sample analyses for all the "priority pollutants" except for the Dioxins and Furans as specified in s. NR 200.065, Table 1, Wis. Adm. Code. The permit-required monitoring for arsenic, cadmium, chromium, copper, lead, nickel, zinc, and mercury is used in this evaluation.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.". Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation. The data shown in the tables below are from 04/01/2019 – 05/31/2025.

Effluent Data – Outfall 001

	Arsenic µg/L		Cadmium µg/L**
1-day P_{99}	1.53	1-day P_{99}	
4-day P_{99}	1.06	4-day P_{99}	
30-day P_{99}	0.81	30-day P_{99}	
Mean	0.69	Mean*	0.014
Std	0.27	Std	
Sample size	25	Sample size	322
Range	0.38 - 1.3	Range	<0.5 – 2.9

	Chromium µg/L**		Copper µg/L**
1-day P_{99}		1-day P_{99}	
4-day P_{99}		4-day P_{99}	
30-day P_{99}		30-day P_{99}	
Mean*	0.43	Mean*	0.36
Std		Std	
Sample size	322	Sample size	322
Range	<5.3 - 52	Range	<6.1 - 36
	Lead µg/L**		Nickel µg/L
1-day P_{99}		1-day P_{99}	12.7
4-day P_{99}		4-day P_{99}	6.70
30-day P_{99}		30-day P_{99}	3.40
Mean*	0.49	Mean*	1.63
Std		Std	3.08
Sample size	322	Sample size	322
Range	<11 – 30	Range	<4.1 - 23
	Mercury ng/L***		Zinc µg/L
1-day P_{99}	3.74	1-day P_{99}	47.5
4-day P_{99}	2.18	4-day P_{99}	22.0
30-day P_{99}	1.37	30-day P_{99}	9.48
Mean*	1.01	Mean*	3.18
Std	0.7	Std	16.9
Sample size	74	Sample size	322
Range	<0.2 - 4.6	Range	<9.6 - 120

* Results below the level of detection (LOD) were included as zeroes in calculation of average.
**There were less than 11 detected results.
***The mercury data from 03/07/2023 was removed in this evaluation because it was unusually high and not representative of normal conditions. Other mercury samples collected that day were within normal ranges.

Effluent Data – Outfall 002

	Arsenic µg/L		Cadmium µg/L**
1-day P_{99}	0.99	1-day P_{99}	
4-day P_{99}	0.80	4-day P_{99}	
30-day P_{99}	0.60	30-day P_{99}	
Mean*	0.51	Mean*	0.031
Std	0.15	Std	
Sample size	25	Sample size	322
Range	<0.28 - 0.86	Range	<1.3 – 1.0
	Chromium µg/L		Copper µg/L**
1-day P_{99}	12.6	1-day P_{99}	
4-day P_{99}	7.08	4-day P_{99}	
30-day P_{99}	2.65	30-day P_{99}	
Mean*	0.43	Mean*	0.17
Std	11.3	Std	

Sample size	322	Sample size	322
Range	<2.4 - 49	Range	<6.1 – 12
	Lead µg/L**		Nickel µg/L
1-day P_{99}		1-day P_{99}	5.79
4-day P_{99}		4-day P_{99}	2.44
30-day P_{99}		30-day P_{99}	1.12
Mean*	0.30	Mean*	0.37
Std		Std	1.58
Sample size	322	Sample size	322
Range	<11 - 24	Range	<4.1 – 9.6
	Mercury ng/L		Zinc µg/L
1-day P_{99}	4.14	1-day P_{99}	71.6
4-day P_{99}	2.49	4-day P_{99}	40.5
30-day P_{99}	1.66	30-day P_{99}	21.7
Mean	1.28	Mean*	10.8
Std	0.80	Std	14.8
Sample size	74	Sample size	322
Range	0.52 - 5.4	Range	<34 - 120

* Results below the level of detection (LOD) were included as zeroes in calculation of average.
**There were less than 11 detected results.

Effluent Chloride Data

	Outfall 001	Outfall 002
1-day P_{99}	366	334
4-day P_{99}	322	277
30-day P_{99}	297	245
Mean	283	227
Std	32.5	39.3
Sample size	19	19
Range	220 - 350	160 - 320
Date Range	06/21/2007 – 04/18/2023	06/21/2007 – 04/18/2023

The following table presents the average concentrations and loadings at Outfalls 001 and 002 from 04/01/2019 – 03/31/2025 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Parameter Averages with Limits

	Outfall 001 Average Measurement	Outfall 002 Average Measurement	Outfall 002 Average Mass Discharged
BOD_5	13.7 mg/L*	7.8 mg/L*	
TSS	9.4 mg/L*	6.7 mg/L*	6,640 lbs/day
pH field	7.2 s.u.	7.1 s.u.	
Phosphorus	0.46 mg/L	0.23 mg/L	208 lbs/day
Mercury	1.01 ng/L*	1.28 ng/L	

	Outfall 001 Average Measurement	Outfall 002 Average Measurement	Outfall 002 Average Mass Discharged
Chlorine	<100 µg/L	<100 µg/L	
Fecal coliform	280 #/100 mL*	254 #/100 mL*	

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P_{99}) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling for all the detected substances. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L) and mercury (ng/L).

Outfall 001

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)
10:1 dilution

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Chlorine		19.0		38.1	7.61	<100		
Arsenic		340	0.81	680			1.53	1.3
Cadmium	365	19		38	7.6	0.014		2.9
Chromium	301	4446		8892	1778	0.43		52
Copper	365	53		105	21	0.36		36
Lead	356	365		729	146	0.49		30
Mercury		830	0.13	1660			3.74	4.6
Nickel	268	1080		2161			12.7	23
Zinc	333	345		689			47.5	120
Chloride (mg/L)		757	21	1514			366	350
Cyanide, Free		22		45	9.0	6.0		

* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Attachment #1

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

10:1 dilution

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Chlorine		7.3		80	16	<100	
Arsenic		148	0.81	1620			1.06
Cadmium	131	3.0		33.4	6.68	0.014	2.9
Chromium	131	108		1183	237	0.43	52
Copper	131	13		143	28.6	0.36	
Lead	131	36		400	80	0.49	
Mercury		440	0.13	440			2.18
Nickel	131	66		721			6.70
Zinc	131	152		1677			22.0
Chloride (mg/L)		395	21	4135			322
Cyanide, Free		5.2		57	11	6.0	

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Monthly Average Limits based on Wildlife Criteria (WC)

10:1 dilution

SUBSTANCE	WC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Mercury (ng/L)	1.3	0.13	1.3			**1.37**

Monthly Average Limits based on Human Threshold Criteria (HTC)

10:1 dilution

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Cadmium	4.4		48	9.6	0.014	
Chromium (+3)	100		1100	220	0.43	
Lead	10		110	22	0.49	
Mercury	1.5	0.13	1.5			1.37
Nickel	100		1100			3.40
Cyanide, Total	139		1525	305	6.0	
Toluene	1000		11000	2200	0.43	
Diethyl Phthalate	5000		55000	11000	0.38	

Monthly Average Limits based on Human Cancer Criteria (HCC)

10:1 dilution

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Arsenic	0.2	0.81	0.2			**0.81**
Chloroform	53		583	117	1.2	
Dichlorobromomethane	53		583	117	0.74	
Trichloroethylene	5.0		55	11	0.39	

Outfall 002

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

4:1 dilution

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Chlorine		19.0		38.1	7.61	<100		
Arsenic		340	0.81	680			0.99	0.86
Cadmium	296	15		30	6.1	0.031		5.5
Chromium	296	4385		8771			12.6	49
Copper	296	43		86	17	0.17		12
Lead	296	305		610	122	0.30		24
Mercury		830	0.13	1660			4.14	5.4
Nickel	268	1080		2161			5.79	9.6
Zinc	296	311		622			71.6	120
Chloride (mg/L)		757	21	1514			334	320
Cyanide, Free		22		45	9.0	6.3		

* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

** The limit for this substance is based on a secondary value. Acute limits are set equal to the secondary value rather than two times.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

4:1 dilution

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Chlorine		7.3		80	16	<100	
Arsenic		148	0.81	737			0.80
Cadmium	131	3.0		15	3.0	0.031	
Chromium	131	108		538			7.08
Copper	131	13		65	13	0.17	
Lead	131	36		182	36	0.30	
Mercury		440	0.13	440			2.49
Nickel	131	66		328			2.44

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SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Zinc	131	152		762			40.5
Chloride (mg/L)		395	21	1891			277
Cyanide, Free		5.2		26	5.2	**6.3**	

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Monthly Average Limits based on Wildlife Criteria (WC)
4:1 dilution

SUBSTANCE	WC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Mercury (ng/L)	1.3	0.13	1.3			**1.66**

Monthly Average Limits based on Human Threshold Criteria (HTC)
4:1 dilution

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Cadmium	4.4		22	4.4	0.031	
Chromium (+3)	100		500			2.65
Lead	10		50	10	0.30	
Mercury	1.5	0.13	1.5			**1.66**
Nickel	100		500			1.12
Cyanide, Total	139		693	139	6.3	
Toulene	1000		5000	1000	14	

Monthly Average Limits based on Human Cancer Criteria (HCC)
4:1 dilution

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Arsenic	0.2	0.81	0.2			**0.60**
Chloroform	53		265	53	0.74	

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8), Wis. Adm. Code, requires the evaluation of the cumulative cancer risk. Because only one parameter requires limits based on HCC, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations
Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are required for chlorine and mercury and considered for arsenic and free cyanide.

Total Residual Chlorine – Because chlorine is added as a disinfectant, effluent limitations are recommended to assure proper operation of the de-chlorination system. Section NR 210.06(2)(b), Wis. Adm. Code, states, "When chlorine is used for disinfection, the daily maximum total residual chlorine concentration of the discharge may not exceed 0.10 mg/L." Because the WQBELs are more restrictive, they are recommended instead. Specifically, **a daily maximum limit of 38 µg/L is required. The current weekly and monthly average effluent limitations of 36 µg/L should be included in the permit** because they are more restrictive than the daily maximum limits and the calculated weekly average limits.

Chloride – Considering available effluent data from 06/21/2007 – 04/18/2023, the 1-day P_{99} chloride concentration is 366 mg/L for Outfall 001 and 334 mg/L for Outfall 002, and the 4-day P_{99} of effluent data is 322 mg/L for Outfall 001 and 277 mg/L for Outfall 002.

These effluent concentrations are below the calculated WQBELs for chloride, therefore no effluent limits are needed. Chloride monitoring is recommended to ensure that 11 sample results are available at the next permit issuance to meet the data requirements of s. NR 106.85, Wis. Adm. Code.

Mercury – A review of data from 04/01/2019 – 05/31/2025 indicates the 30-day P_{99} is 1.37 ng/L for Outfall 001 and 1.66 ng/L for Outfall 002, which is above the wildlife criterion of 1.3 ng/L. Therefore, **a mercury effluent limits are required for both Outfalls.**

Please see Attachment #2 for information for the Mixing Zone Phase-Out Exception for Mercury which Milwaukee has submitted a request for.

Arsenic – The current permit requires city water intake and effluent monitoring of arsenic. Below is the table to summarize the city water intake and effluent data for comparison:

Arsenic Data

	City Water Lake Michigan Intake µg/L	Outfall 001 Effluent Arsenic µg/L	Outfall 002 Effluent Arsenic µg/L
1-day P_{99}	1.22	1.53	0.99
4-day P_{99}	1.01	1.06	0.80
30-day P_{99}	0.88	0.81	0.60
Mean*	0.82	0.69	0.51
Std	0.15	0.27	0.15
Sample size	20	25	25
Range	0.53 – 1.2	0.38 – 1.3	<0.28 – 0.86

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

Approximately 2-3% of city intake water is groundwater from potable and private wells in Germantown, Brookfield, Elm Grove, and Muskego which were not monitored during the permit term and the arsenic data is not included in this evaluation.

Section NR 106.06(6), Wis. Adm. Code, allows a facility to demonstrate that a pollutant present in intake water, which is passed through the facility and discharged does not cause, have the reasonable potential to

cause, or contribute to the excursion of water quality criteria in the receiving water. The demonstration has five conditions, all of which must be met:

1. The permittee withdraws 100 percent of its intake water containing the substance from the same body of water into which the discharge is made;
2. The permittee does not contribute any additional mass of the substance to the wastewater;
3. The permittee does not alter the substance chemically or physically in a manner that would cause adverse water quality impacts to occur that would not occur if the pollutants were left in-stream;
4. The permittee does not increase the concentration at the edge of the mixing zone, or at the point of discharge if a mixing zone is not allowed, as compared to the concentration in the intake water, unless the increased concentration does not cause or contribute to an excursion above an applicable water quality standard; and
5. The timing and location of the discharge would not cause adverse water quality impacts to occur that would not occur if the identified intake pollutant were left instream.

Outfall 001

The first condition is not met because approximately 2-3% of the intake to Outfall 001 is groundwater from Germantown, Brookfield, Elm Grove, and Muskego. Because the conditions of s NR 106.06(6), Wis. Adm. Code, are not satisfied and the 30-day P_{99} exceeds calculated WQBEL based on WC, **Milwaukee Met will need an arsenic limit of 0.2 µg/L as a monthly average based on wildlife criteria.**

Milwaukee Met may apply for a variance for the arsenic limit per s. 283.15, Wis. Adm. Code. It's recommended that an alternative variance limitation shall equal the 1-day P_{99} of the effluent data and shall be expressed as a daily maximum concentration. If a variance is granted and approved by US Environmental Protection Agency, then **an alternative arsenic limitation of 1.5 µg/L for Outfall 001 is required.**

Outfall 002

All conditions per s. NR 106.06(6), Wis. Adm. Code are met for Outfall 002 and there are no groundwater sources that are discharged to this outfall. Therefore, no arsenic limits are recommended. **Monitoring is recommended to be continued in the reissued permit so that the conditions in s. NR 106.06(6), Wis. Adm. Code may be reevaluated for the next issuance.**

Amenable Cyanide – The single sample for amenable cyanide for Outfall 002 was 6.3 µg/L which is greater than 1/5th of the calculated limit for free cyanide based on CTC. The amenable cyanide sample from the previous permit term is also used in this evaluation to use in the reasonable potential determination.

Effluent Amenable Cyanide Data

Sample Date	Outfall 002 Effluent Amenable Cyanide µg/L
09/16/2016	<3.6
03/08/2023	6.3
Average*	3.2

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

Based on the average of the two available samples, there is not reasonable potential for limits when comparing the average to 1/5th of the most stringent limit of 26 µg/L. Therefore, **no limits or monitoring is recommended in the reissued permit.**

In addition, the samples that were submitted to the department are for amenable cyanide, while the criteria in ch. NR 105, Wis. Adm. Code, is for free cyanide. Although the results are likely similar and are often interchanged for reporting purposes, amenable cyanide may be an overestimation of free cyanide. This is because amenable cyanide includes free cyanide plus weak acid dissociable metal cyanide complexes that may or may not release free cyanide into the environment.

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Previous monitoring produced a PFOS result of 7.07 ng/L and a PFOA result of 5.26 ng/L at Outfall 002. These results are greater than one fifth of the respective criteria for each substance. Based on the effluent flow rate and the available PFOS/PFOA monitoring data, PFOS and PFOA monitoring is recommended at a monthly frequency at both Outfalls 001 and 002.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has monitoring only for Outfall 002 and daily maximum, weekly average and monthly average limits for November – April for Outfall 001. These limits are re-evaluated at this time due to the following changes:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- Section NR 106.07(3), Wis. Adm. Code requires weekly and monthly average limits for municipal treatment plants.
- The maximum expected effluent pH has changed

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)
Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation:

$$ATC \text{ in mg/L} = [A \div (1 + 10^{(7.204 - pH)})] + [B \div (1 + 10^{(pH - 7.204)})]$$

Where:

A = 0.275 and B = 39.0 for a Cold-Water Category 1 fishery, and
pH (s.u.) = that characteristic of the effluent.

Outfall 001
The effluent pH data was examined as part of this evaluation. A total of 1704 sample results were reported from 04/02/2019 – 11/30/2023. The maximum reported value was 7.7 s.u. (Standard pH Units). The effluent pH was 7.4 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.4 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.4 s.u. Therefore, a value of 7.4 s.u. is believed to represent the maximum reasonably expected pH, and therefore

most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.4 s.u. into the equation above yields an ATC = 15 mg/L.

Outfall 002
A total of 1705 sample results were reported from 04/02/2019 – 11/30/2023. The maximum reported value was 7.7 s.u. (Standard pH Units). The effluent pH was 7.4 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.4 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.4 s.u. Therefore, a value of 7.4 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.4 s.u. into the equation above yields an ATC = 15 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method
In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are calculated using the the 1-Q_{10} receiving water low flow if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q_{10} (estimated as 80 % of 7-Q_{10}) and the 2×ATC approach are shown below.

Daily Maximum Ammonia Nitrogen Determination – Outfalls 001 and 002

	Ammonia Nitrogen Limit mg/L
2×ATC	31
10:1 dilution Outfall 001	168
10:1 dilution Outfall 002	77

The 2×ATC method yields the most stringent limits for Milwaukee Metropolitan.

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)
The ammonia limit calculation also warrants evaluation of weekly and monthly average limits based on chronic toxicity criteria for ammonia, because those limits relate to the assimilative capacity of the receiving water.

Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria in ch. NR 105, Wis. Adm. Code.

The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified for a Cold-Water Community is calculated by the following equation, according to subchapter IV of NR 106, Wis. Adm. Code.

$$CTC = E \times \{[0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})]\} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,
E = 0.854,
C = the minimum of 2.85 or $1.45 \times 10^{(0.028 \times (25 - T))}$,
T = the temperature (ºC) of the receiving water

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used to derive weekly average limitations, and the 30-day criteria are used to derive monthly average limitations, both by a mass-balance using a ten-to-one dilution ratio.

The "default" basin assumed values are used for Temperature, pH and background ammonia concentrations, because minimum ambient data is available. These values are shown in the table below, with the resulting criteria and effluent limitations.

Weekly and Monthly Ammonia Nitrogen Limits – Outfall 001

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Qe (MGD)	113	113	113
Background Information	Ammonia (mg/L)	0.04	0.03	0.08
	Average Temperature (°C)	8	15	4
	Maximum Temperature (°C)	9	16	11
	pH (s.u.)	8.18	8.25	8.05
	Dilution factor	10	10	10
Criteria mg/L	4-day Chronic	4.65	3.77	5.65
	30-day Chronic	1.86	1.51	2.26
Effluent Limits mg/L	Weekly Average	51	41	61
	Monthly Average	20	16	24

Weekly and Monthly Ammonia Nitrogen Limits – Outfall 002

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Qe (MGD)	123	123	123
Background Information	Ammonia (mg/L)	0.04	0.03	0.08
	Average Temperature (°C)	8	15	4
	Maximum Temperature (°C)	9	16	11
	pH (s.u.)	8.18	8.25	8.05
	Dilution factor	4	4	4
Criteria mg/L	4-day Chronic	4.65	3.77	5.65
	30-day Chronic	1.86	1.51	2.26
Effluent Limits mg/L	Weekly Average	23	19	28
	Monthly Average	9.1	7.4	11

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 04/01/2019 – 03/31/2025, with those results being compared to the calculated limits to determine the need to include ammonia limits in Milwaukee Metropolitan's permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P_{99}) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Ammonia Nitrogen Effluent Data – Outfall 001

Ammonia Nitrogen mg/L	April - May	June - September	October - March
1-day P_{99}	6.09	7.97	9.15
4-day P_{99}	3.31	4.32	5.05

Attachment #1

Ammonia Nitrogen mg/L	April - May	June - September	October - March
30-day P_{99}	1.60	2.15	2.32
Mean*	0.90	1.26	1.21
Std	1.32	1.69	2.05
Sample size	366	732	1094
Range	<0.072 – 8.6	<0.013 – 13	<0.017 – 18

*Values lower than the level of detection were substituted with a zero

Ammonia Nitrogen Effluent Data – Outfall 002

Ammonia Nitrogen mg/L	April - May	June - September	October - March
1-day P_{99}	3.03	3.53	3.97
4-day P_{99}	1.64	1.92	2.21
30-day P_{99}	0.81	0.92	0.98
Mean*	0.47	0.51	0.48
Std	0.65	0.78	0.95
Sample size	366	732	1094
Range	<0.072 – 3.9	<0.072 – 5.7	<0.014 – 8.6

*Values lower than the level of detection were substituted with a zero

Based on this comparison, there is no reasonable potential for the discharge to exceed any of the calculated ammonia nitrogen limits.

Outfall 001

The permit currently has weekly average and monthly average limits November – April for Outfall 001. Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

> (b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

Conclusions and Recommendations

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code. Limits to meet the requirements in s. NR 106.07, Wis. Adm Code, are addressed in the expression of limits section of this memo.

Final Ammonia Nitrogen Limits – Outfall 001

	Weekly Average mg/L	Monthly Average mg/L
November – April	27	**27**

Monitoring only May – October for Outfall 001 and year-round for Outfall 002 is recommended to continue in the reissued permit to determine reasonable potential in the next reissuance.

Attachment #1

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

On May 1, 2020, revisions to chs. NR 102 and NR 210, Wis. Adm. Codes, became effective which replace fecal coliform limits with new *Escherichia coli* (*E. coli*) limits for protection of recreational uses. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

1. The geometric mean of *E. coli* bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

E. coli monitoring is recommended at the same frequency that fecal coliform monitoring is required in the current permit. Any additional monitoring beyond what is required by the permit must also be reported on the DMR as required in the standard requirements section of the permit.

These limits are required year-round. No changes are recommended to the current recreational period and the required disinfection season.

The current permit requires Milwaukee Metropolitan to disinfect year-round for protection of the public water supply. Because the *E. coli* limits listed in NR 210.06(2)(a)1, Wis. Adm. Code, are set for protection of recreational uses and not drinking water supply, these *E. coli* limits do not necessarily need to be applied year-round. However, either *E. coli* or fecal coliform bacteria limits are needed year-round in order to ensure that there is no reduction from the current level of disinfection needed to protect the public drinking water source.

In accordance with s. NR 210.06(2)(a)2, Wis. Adm. Code, outside of the recreational season, bacteria limits may either be set equal to the previous fecal coliform limits or the listed *E. coli* limits. Therefore, the facility can select one of the two possible sets of permit limits:

- *E. coli* limits as listed above during the recreation period of May through September and a fecal coliform limit of 400 counts/100 mL as a monthly geometric mean in October through April. Any fecal coliform weekly geometric mean limit which was included in the previous permit for expression of limits purposes does not need to be included in the reissued permit.
- *E. coli* limits as listed above apply year-round.

Effluent Data

Milwaukee Metropolitan has monitored effluent *E. coli* from 04/01/2019 – 11/30/2023 and a total of 1704 results for Outfall 001 and 1705 results for Outfall 002 are available.

Outfall 001

A geometric mean of 126 counts/100 mL was exceeded in 20 out of the last 56 months, with a maximum monthly geometric mean of 485 counts/100 mL. Effluent data has exceeded 410 counts/100 mL 363 times (which is 21% of the total sample results). The maximum reported value was 240000 counts/100 mL. Based on this effluent data it appears that the facility can't meet new *E. coli* limits and a compliance schedule is needed in the reissued permit for Outfall 001.

Outfall 002
A geometric mean of 126 counts/100 mL was exceeded in 11 out of the last 56 months, with a maximum monthly geometric mean of 310 counts/100 mL. Effluent data has exceeded 410 counts/100 mL 216 times (which is 13% of the total sample results). The maximum reported value was 130000 counts/100 mL. Based on this effluent data it appears that the facility can't meet new *E. coli* limits and a compliance schedule is needed in the reissued permit for Outfall 002.

Interim Limit
At this time, available *E. Coli* data indicates that the new limitations are not readily attainable. The permit will include a compliance schedule to meet these limits. During the compliance schedule, an interim limit applies to prevent back-sliding from the current level of disinfection during the compliance schedule period. Therefore, the current **fecal coliform limit shall be included in the reissued permit as an interim limit of 400 counts/100 mL as a monthly geometric mean**. Any weekly geometric mean limit which was included in the current permit for expression of limits purposes does not need to be included in the permit as an interim limit.

PART 5 – PHOSPHORUS

Technology-Based Effluent Limit
Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

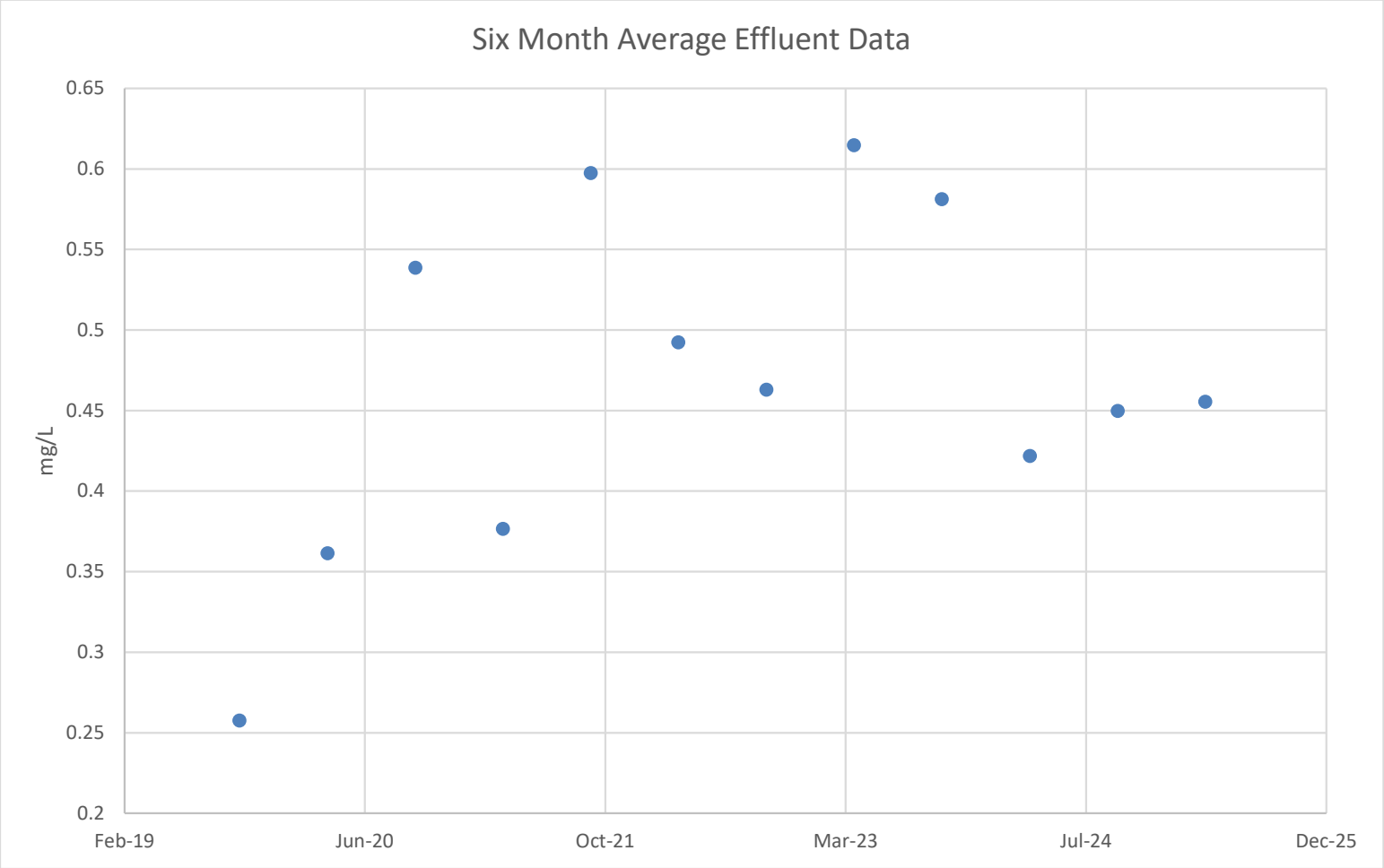
Because Milwaukee Met currently has a monthly average limit of 1.0 mg/L for Outfall 001 and 0.66 mg/L for Outfall 002 as monthly averages, these limits should be included in the reissued permit as they are equal to or more stringent than the TBEL.

Water Quality-Based Effluent Limits (WQBEL) – Outfall 001
Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

Section NR 102.06(5)(b) specifies that a total phosphorus criterion of 7 µg/L (0.007 mg/L) applies for the open and nearshore water of Lake Michigan. For direct discharges to Lake Michigan such as Milwaukee Metropolitan, s. NR 217.13(4), Wis. Adm. Code, states that the Department shall set effluent limits consistent with nearshore or whole lake models approved by the Department. In the absence of an approved model, **a WQBEL of 0.6 mg/L as a six-month average is recommended.**

The current permit has a six-month average limit of 0.7 mg/L for Outfall 001. The graph below shows the six-month average data submitted during the current permit term. Because the effluent from 001 can readily meet the six-month average limit of 0.6 mg/L, **this limit is recommended to be effective in the reissued permit.**

Attachment #1



Milwaukee TMDL – Outfall 002
The TMDL report addresses phosphorus water quality impairments within the Milwaukee River Basin and provides waste load allocations (WLAs) required to meet water quality standards. Effluent limitations based on these WLAs must be included in WPDES permits according to s. NR 217.16, Wis. Adm. Code. The TMDL-derived phosphorus limits may be included in lieu of or in addition to the calculated limits upon permit reissuance or modification if certain conditions are met and the s. NR 217.13, Wis. Adm. Code WQBEL has not yet taken effect.

Because the Milwaukee River Basin TMDL was developed to protect and improve the water quality of all streams and rivers within the basin, and the s. NR 217.13, Wis. Adm. Code WQBEL has not taken effect for Milwaukee Met, the TMDL-based limits can be included in the WPDES permit in place of the s. NR 217.13, Wis. Adm. Code, WQBEL. The TMDL-based limits should be expressed in a manner consistent with the wasteload allocation and assumptions of the TMDL.

The monthly average total phosphorus (TP) effluent limits in lbs/day are calculated based on the maximum monthly phosphorus WLA given in pounds per month as suggested in the TMDL report and implementation guidance. The monthly maximum TP WLAs for this facility are found in Appendix A of the Milwaukee River Basin TMDL report. **The monthly average limits shown in the table below are**

recommended in place of the s. NR 217.13, Wis. Adm. Code, limit, and should be expressed in pounds per day. For informational purposes, the TMDL mass limits in the following table are equivalent to monthly average concentrations ranging 0.65 mg/L to 0.72 mg/L at the annual average design flow of 123 MGD.

Total Phosphorus Wasteload Allocations and Effluent Limits – Outfall 002

Month	Monthly Maximum TP WLA[1] (lbs/month)	Days Per Month	Monthly Average TP Effluent Limit[2] (lbs/day)
Jan	20,593	31	664
Feb	20,593	28	735
Mar	20,593	31	664
Apr	20,593	30	686
May	20,593	31	664
Jun	20,593	30	686
Jul	20,593	31	664
Aug	20,593	31	664
Sep	20,593	30	686
Oct	20,593	31	664
Nov	20,593	30	686
Dec	20,593	31	664

Footnotes:
1- Milwaukee River Basin TMDL Appendix A. Monthly Total Suspended Solids Wasteload Allocation by Permitted Point Source. Table A.17 for the Estuary Watershed
2- Monthly Average Total P effluent limit (lbs/day) = monthly Total P WLA (lbs/month) ÷ days per month

Milwaukee Met is currently meeting these TMDL-based phosphorus limits and no changes are recommended for Outfall 002.

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from 04/01/2019 – 03/31/2025.

Total Phosphorus Effluent Data

	Outfall 001 Phosphorus mg/L	Outfall 002 Phosphorus mg/L	Outfall 002 Phosphorus lbs/day
1-day P_{99}	1.61	0.93	1035
4-day P_{99}	0.95	0.53	565
30-day P_{99}	0.61	0.32	314
Mean	0.47	0.24	208
Std	0.31	0.19	211
Sample size	2192	2192	2192
Range	0.091 - 5.4	0.047 - 4.2	42 - 2500

PART 6 – TOTAL SUSPENDED SOLIDS – OUTFALL 002

The TMDL also has wasteload allocations (WLAs) for total suspended solids (TSS) for Outfall 002. For a municipal facility, the limits for TSS must be expressed as weekly and monthly averages. The current permit includes a weekly average limit of 45 mg/L and a monthly average limit of 30 mg/L and monthly TMDL-based mass limits.

Milwaukee Met is currently meeting their monthly WLA of 936,052 lbs/month for TSS. The highest monthly loading reported was 285,726 lbs/month. Therefore, **no changes are recommended for the TMDL-based TSS limits.**

Monthly average and weekly average mass effluent limitations derived from the TMDL WLAs should be included in the permit according to the table below, along with the currently imposed concentration limits.

Total Suspended Solids Wasteload Allocations

Month	Weekly Ave TSS Effluent Limit[4] (lbs/day)	Monthly Ave TSS Effluent Limit[2] (lbs/day)
Jan	51,332	30,195
Feb	56,832	33,430
Mar	51,332	30,195
Apr	53,043	31,202
May	51,332	30,195
Jun	53,043	31,202
Jul	51,332	30,195
Aug	51,332	30,195
Sep	53,043	31,202
Oct	51,332	30,195
Nov	53,043	31,202
Dec	51,332	30,195

Effluent Data

The following table summarizes effluent total suspended solids monitoring data from 04/01/2019 – 11/30/2023 for informational purposes.

Effluent TSS Data – Outfall 002

	TSS (mg/L)	TSS (lbs/day)
1-day P_{99}	23.0	40414
4-day P_{99}	13.6	21849
30-day P_{99}	8.85	11053
Mean	6.71	6640
Std	4.51	8494
Sample Size	2193	2193
Range	2 – 86	950 – 110000

Attachment #1

PART 7 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from 04/01/2019 – 03/31/2025.

Outfall 001

The table below summarizes the maximum temperatures reported during monitoring from 01/01/2022 – 12/31/2022.

Monthly Temperature Effluent Data & Limits – Outfall 001

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	57	58	**43**	69
FEB	54	55	**46**	69
MAR	54	56	**52**	70
APR	54	58	59	70
MAY	61	71	65	72
JUN	73	78	**70**	**73**
JUL	69	78	71	**74**
AUG	70	75	70	76
SEP	70	78	**64**	**74**
OCT	69	81	**57**	**73**
NOV	64	66	**49**	71
DEC	60	71	**44**	**70**

Reasonable Potential

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
  (a) The highest recorded representative daily maximum effluent temperature
  (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub−lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
  (a) The highest weekly average effluent temperature for the month.
  (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. Based on this analysis, daily maximum temperature limits are needed for the months of June, July, September, October and December and weekly average temperature maximum limits are necessary for the months of January – March and September – December.

Milwaukee Metropolitan has submitted a request for consideration of dissipative cooling (DC) in 2012, referencing a previous dissipative cooling study and a statement that there have not been substantial changes to the facility. The DC study had demonstrated there was rapid cooling from the outfall within the mixing zone. Based on this information, the department has found that it is not necessary to include temperature limits in the reissued permit. No updates to the DC study are needed. **Temperature monitoring for one year is recommended** per the requirements of s. NR 106.59(7), Wis. Adm. Code.

Outfall 002

The table below summarizes the maximum temperatures reported during monitoring from 01/01/2022 – 12/31/2022.

Monthly Temperature Effluent Data & Limits – Outfall 002

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	58	59	**45**	76
FEB	56	61	**50**	75
MAR	57	59	**55**	76
APR	58	59	62	74
MAY	63	66	67	75
JUN	70	73	74	76
JUL	74	78	**74**	**76**
AUG	74	75	**72**	78

Attachment #1

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
SEP	73	75	**65**	76
OCT	71	72	**58**	75
NOV	66	69	**50**	75
DEC	61	62	**46**	75

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. Based on this analysis, daily maximum temperature limits are needed for the month of July and weekly average temperature maximum limits are necessary for the months of January – March July – December.

Milwaukee Metropolitan has submitted a request for consideration of dissipative cooling in 2012, referencing a previous dissipative cooling study and a statement that there have not been substantial changes to the facility. The DC study had demonstrated there was rapid cooling from the outfall within the mixing zone. Based on this information, the department has found that it is not necessary to include temperature limits in the reissued permit. **Temperature monitoring for one year is recommended** per the requirements of s. NR 106.59(7), Wis. Adm. Code.

Future WPDES Permit Reissuance
Dissipative cooling requests must be re-evaluated every permit reissuance. The permittee is responsible for submitting an updated DC request prior to permit reissuance. Such a request must either include:
a) A statement by the permittee that there have been no substantial changes in operation of, or thermal loadings to, the treatment facility and the receiving water; or
b) New information demonstrating DC to supplement the information used in the previous DC determination. If significant changes in operation or thermal loads have occurred, additional DC data must be submitted to the Department.

PART 8 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document (2022).*

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than

100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.

- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWCs for Outfalls 001 and 002 are shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

  Outfall 001: The IWC is 9% based on dilution of 10 parts lake water to 1-part effluent, as specified in s. NR 106.06(4)(b)2, Wis. Adm. Code, or a factor of 1 in 11 to calculate the IWC.

  Outfall 002: The IWC is 20% based on dilution of 4 parts lake water to 1-part effluent, as specified in s. NR 106.06(4)(b)2, Wis. Adm. Code, or a factor of 1 in 5 to calculate the IWC.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfalls 001 and 002 shall be a grab sample collected from the receiving water location, out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.

Outfall 001

Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08(3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

WET Data History – Outfall 001

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %				Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Pass or Fail?	Use in RP?	
10/13/2005	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
01/26/2006	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
04/19/2007	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
02/28/2013	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
04/24/2014	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
10/22/2015	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
04/28/2016	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
10/24/2017	>100	>100	Pass	Yes	>100	59	Pass	Yes	

Attachment #1

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %				Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Pass or Fail?	Use in RP?	
07/31/2018	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
02/12/2019	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
08/06/2020	>100	>100	Pass	No		>100	Pass	No	1
09/10/2020	>100		Pass	Yes	31.9		Fail	No	1
11/10/2020					>100		Pass	Yes	
06/22/2021	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
11/01/2022	>100	>100	Pass	Yes	48.9	>100	Pass	Yes	
04/18/2023	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
01/16/2024	>100	>100	Pass	Yes	>100	>100	Pass	Yes	

Footnotes:

1. *Qualified or Inconclusive Data.* Data quality concerns were noted during testing which calls into question the reliability of the test results.

- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

  Acute Reasonable Potential = [(TUa effluent) (B)(AMZ)]
  Chronic Reasonable Potential = [(TUc effluent) (B)(IWC)]

  According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC_{50}, IC_{25} or $IC_{50} \geq 100\%$).

  Chronic Reasonable Potential = $0 < 1.0$, reasonable potential is not shown, and a limit is not required.

  Chronic Reasonable Potential = [(TU_c effluent) (B)(IWC)]

Chronic WET Limit Parameters

TUc (maximum) $100/IC_{25}$	**B** (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/48.9 = 2.04	3.8 Based on 2 detects	9%

[(TUc effluent) (B)(IWC)] = $0.70 < 1.0$

Therefore, no reasonable potential is shown for chronic WET limits using the procedures in s. NR 106.08(6) and representative data from 10/13/2005 – 04/18/2023.

The WET checklist was developed to help DNR staff make recommendations regarding WET limits,

monitoring, and other related permit conditions. The checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The checklist steps the user through a series of questions, assesses points based on the potential for effluent toxicity, and suggests monitoring frequencies based on points accumulated during the checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. A summary of the WET checklist analysis completed for this permittee is shown in the table below. Staff recommendations based on best professional judgment are provided below the summary table. For guidance related to reasonable potential and the WET checklist, see Chapter 1.3 of the WET Guidance Document: https://dnr.wisconsin.gov/topic/Wastewater/WET.html.

WET Checklist Summary – Outfall 001

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 9%. **0 Points**
Historical Data	14 tests used to calculate RP. No tests failed. **0 Points**	14 tests used to calculate RP. No tests failed. **0 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	Coldwater classification. **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Reasonable potential for limits for no substances based on ATC; Ammonia nitrogen limit carried over from the current permit. Arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, chloride, cyanide, and ammonia detected. Additional Compounds of Concern: Toluene, diethyl phthalate, chloroform, dichlorobromomethane, and trichloroethylene **5 Points**	Reasonable potential for limits for no substances based on CTC; Ammonia nitrogen limit carried over from the current permit. Arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, chloride, cyanide, and ammonia detected. Additional Compounds of Concern: Toluene, diethyl phthalate, chloroform, dichlorobromomethane, and trichloroethylene **5 Points**
Additives	1 Biocide and 3 Water Quality Conditioners added. Permittee has proper P chemical SOPs in place: Yes. **6 Points**	All additives used more than once per 4 days. **6 Points**
Discharge Category	66 categorical and 79 significant industrial contributors. **15 Points**	Same as Acute. **15 Points**
Wastewater Treatment	Secondary or better. **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known. **0 Points**	Same as Acute. **0 Points**

	Acute	Chronic
Total Checklist Points:	**31 Points**	**31 Points**
Recommended Monitoring Frequency (from Checklist):	1x yearly	1x yearly
Limit Required?	No	No
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above 1x yearly acute and chronic WET tests are recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).
- A minimum of annual acute and chronic monitoring is recommended because Milwaukee Met is a major municipal discharger with a design flow greater than 1.0 MGD. Federal regulations at 40 CFR Part 122.21(j) require at least 4 acute and chronic WET tests with each permit application on samples collected since the previous reissuance. Therefore, annual monitoring is recommended in the permit term, so that data will be available for the next permit application.

Outfall 002

Shown below is a tabulation of all available WET data for Outfall 002. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08(3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

WET Data History – Outfall 002

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %				Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Pass or Fail?	Use in RP?	
10/13/2005	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
01/26/2006	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
04/19/2007	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
02/28/2013	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
04/24/2014	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
10/22/2015	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
04/28/2016	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
10/24/2017	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
07/31/2018	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
02/12/2019	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
08/06/2020	>100	>100	Pass	Yes		>100	Pass	No	1
09/10/2020					20.9		Fail	No	1
11/10/2020					>100		Pass	Yes	

Attachment #1

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %				Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Pass or Fail?	Use in RP?	
05/11//2021	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
11/01/2022	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
04/18/2023	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
01/16/2024	>100	>100	Pass	Yes	>100	>100	Pass	Yes	

Footnotes:

1. *Qualified or Inconclusive Data.* Data quality concerns were noted during testing which calls into question the reliability of the test results.

- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

  Acute Reasonable Potential = [(TUa effluent) (B)(AMZ)]
  Chronic Reasonable Potential = [(TUc effluent) (B)(IWC)]

  According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC_{50}, IC_{25} or $IC_{50} \geq 100\%$).

  Chronic Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

Therefore, no reasonable potential is shown for chronic WET limits using the procedures in s. NR 106.08(6) and representative data from 10/13/2005 – 04/18/2023.

WET Checklist Summary – Outfall 002

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 20%. **0 Points**
Historical Data	14 tests used to calculate RP. No tests failed. **0 Points**	14 tests used to calculate RP. No tests failed. **0 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	Coldwater classification. **5 Points**	Same as Acute. **5 Points**

Attachment #1

	Acute	Chronic
Chemical-Specific Data	Reasonable potential for limits for no substances based on ATC; Arsenic, ammonia chromium, copper, lead, mercury, nickel, zinc, chloride, and cyanide detected. Additional Compounds of Concern: Toulene and chloroform **5 Points**	Reasonable potential for limits for no substances based on CTC; Arsenic, ammonia, chromium, copper, lead, mercury, nickel, zinc, chloride, and cyanide detected. detected. Additional Compounds of Concern: Toulene and chloroform **5 Points**
Additives	1 Biocide and 2 Water Quality Conditioners added. **5 Points**	All additives used more than once per 4 days. **5 Points**
Discharge Category	66 categorical and 79 significant industrial contributors. **15 Points**	Same as Acute. **15 Points**
Wastewater Treatment	Secondary or better. **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known. **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**30 Points**	**30 Points**
Recommended Monitoring Frequency (from Checklist):	1x yearly	1x yearly
Limit Required?	No	No
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above, annual acute and chronic WET tests are recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).
- A minimum of annual acute and chronic monitoring is recommended because Milwaukee Met is a major municipal discharger with a design flow greater than 1.0 MGD. Federal regulations at 40 CFR Part 122.21(j) require at least 4 acute and chronic WET tests with each permit application on samples collected since the previous reissuance. Therefore, annual monitoring is recommended in the permit term, so that data will be available for the next permit application.

Attachment #2

Mixing Zone Phase-Out Exception for Mercury
For Milwaukee Metropolitan – Outfall 001

Milwaukee Met has requested a continued exception to the mixing zone phase out when calculating effluent limitations for mercury beyond November 15, 2010 under the exception for technical and economic considerations to the mixing zone phase-out for bioaccumulating chemicals of concern (BCC's) at 40 CFR, Part 132, Appendix F, Procedure 3 C. 6. In consideration of the requirements contained at the above reference, the Wisconsin Department of Natural Resources (WDNR) determines that:

- Milwaukee Met is in compliance with and shall continue to comply with all applicable requirements of Clean Water Act sections 118, 301, 302, 303, 304, 306, 307, 401, and 402, including existing categorical effluent limits and WQBELs.

- Milwaukee Met will accept a permit compliance schedule requiring the development and implementation of a Mercury Pollution Minimization Plan (PMP) meeting the requirements of s. 106.145(7), Wis. Adm. Code. WDNR believes the finding at s. 106.145(1)(a), Wis. Adm. Code, sufficiently demonstrates that controls beyond a PMP would result in unreasonable economic effects because controls to remove mercury using wastewater treatment technology are not feasible or cost-effective.

- Milwaukee Met discharges directly to Lake Michigan.

- There have not previously been effluent mercury WQBELs included in Milwaukee Met permits (WI-0036820). The current mercury limit is 4.1 ng/L as a daily maximum.

- The discharger has reduced and will continue to reduce, to the maximum extent possible, its discharge of the BCC for which the mixing zone is requested. The mixing zone shall be no larger than necessary to account for the technical constraints and economic effects identified pursuant to this exception. Therefore, the mixing zone shall be set at 0.1 part receiving water:1 part effluent based on the 30-day P_{99} of discharge 1.39 ng/L, the criterion of 1.3 ng/L, and a background concentration of 0.127 ng/L at the facility design flow of 113 MGD.

- The limit shall be set at 3.7 ng/L as a daily maximum, equal to the 1-day P_{99}, with quarterly monitoring.

- The water quality criteria are met at the edge of the mixing zone.

- There is currently no applicable TMDL for mercury in Lake Michigan and available data indicate the concentration of mercury in Lake Michigan meets all applicable water quality criteria.

- Other actions in Wisconsin to reduce releases of mercury include rules to control emissions from utility boilers and proposed mercury product legislation.

- This mixing zone and resulting WQBELs meet the requirements at 40 CFR, Part 132, Appendix F, Procedure 3 D., including that the actions will not jeopardize the continued existence of endangered or threatened species. The requirements for authorizing the exception and the circumstances under which it is being granted are essentially the same as those for granting a

variance to water quality standards. WDNR has analyzed the potential impacts to endangered and threatened species as part of its variance process. The analysis concluded that approval of mercury variances, with more stringent permit requirements for PMPs, is unlikely to adversely affect bald eagles or other listed species that occur within the State of Wisconsin.

Therefore, WDNR grants a mixing zone extension for effluent discharges from the wastewater treatment facility operated by Milwaukee Met due to technical and economic considerations.

The granting of this exception to the Milwaukee Met shall apply only to the 5-year permit term of the proposed WPDES permit. The permittee will need to make a similar request and DNR will need to make a similar determination for a further continuation of a mixing zone, if those actions become appropriate for the next permit term.

Attachment #3

Mixing Zone Phase-Out Exception for Mercury
For Milwaukee Metropolitan – Outfall 002

Milwaukee Met has requested a continued exception to the mixing zone phase out when calculating effluent limitations for mercury beyond November 15, 2010 under the exception for technical and economic considerations to the mixing zone phase-out for bioaccumulating chemicals of concern (BCC's) at 40 CFR, Part 132, Appendix F, Procedure 3 C. 6. In consideration of the requirements contained at the above reference, the Wisconsin Department of Natural Resources (WDNR) determines that:

- Milwaukee Met is in compliance with and shall continue to comply with all applicable requirements of Clean Water Act sections 118, 301, 302, 303, 304, 306, 307, 401, and 402, including existing categorical effluent limits and WQBELs.

- Milwaukee Met will accept a permit compliance schedule requiring the development and implementation of a Mercury Pollution Minimization Plan (PMP) meeting the requirements of s. 106.145(7), Wis. Adm. Code. WDNR believes the finding at s. 106.145(1)(a), Wis. Adm. Code, sufficiently demonstrates that controls beyond a PMP would result in unreasonable economic effects because controls to remove mercury using wastewater treatment technology are not feasible or cost-effective.

- Milwaukee Met Outfall 002 discharges directly to Lake Michigan.

- There have not previously been effluent mercury WQBELs included in Milwaukee Met permits (WI-0036820). The current mercury limit is 4.6 ng/L as a daily maximum.

- The discharger has reduced and will continue to reduce, to the maximum extent possible, its discharge of the BCC for which the mixing zone is requested. The mixing zone shall be no larger than necessary to account for the technical constraints and economic effects identified pursuant to this exception. Therefore, the mixing zone shall be set at 0.4 parts receiving water:1 part effluent based on the 30-day P_{99} of 1.70 ng/L, the criterion of 1.3 ng/L, and a background concentration of 0.127 ng/L at the facility design flow of 123 MGD.

- The limit shall be set at 4.1 ng/L as a daily maximum, equal to the 1-day P_{99}, with quarterly monitoring.

- The water quality criteria are met at the edge of the mixing zone.

- There is currently no applicable TMDL for mercury in Lake Michigan and available data indicate the concentration of mercury in Lake Michigan meets all applicable water quality criteria.

- Other actions in Wisconsin to reduce releases of mercury include rules to control emissions from utility boilers and proposed mercury product legislation.

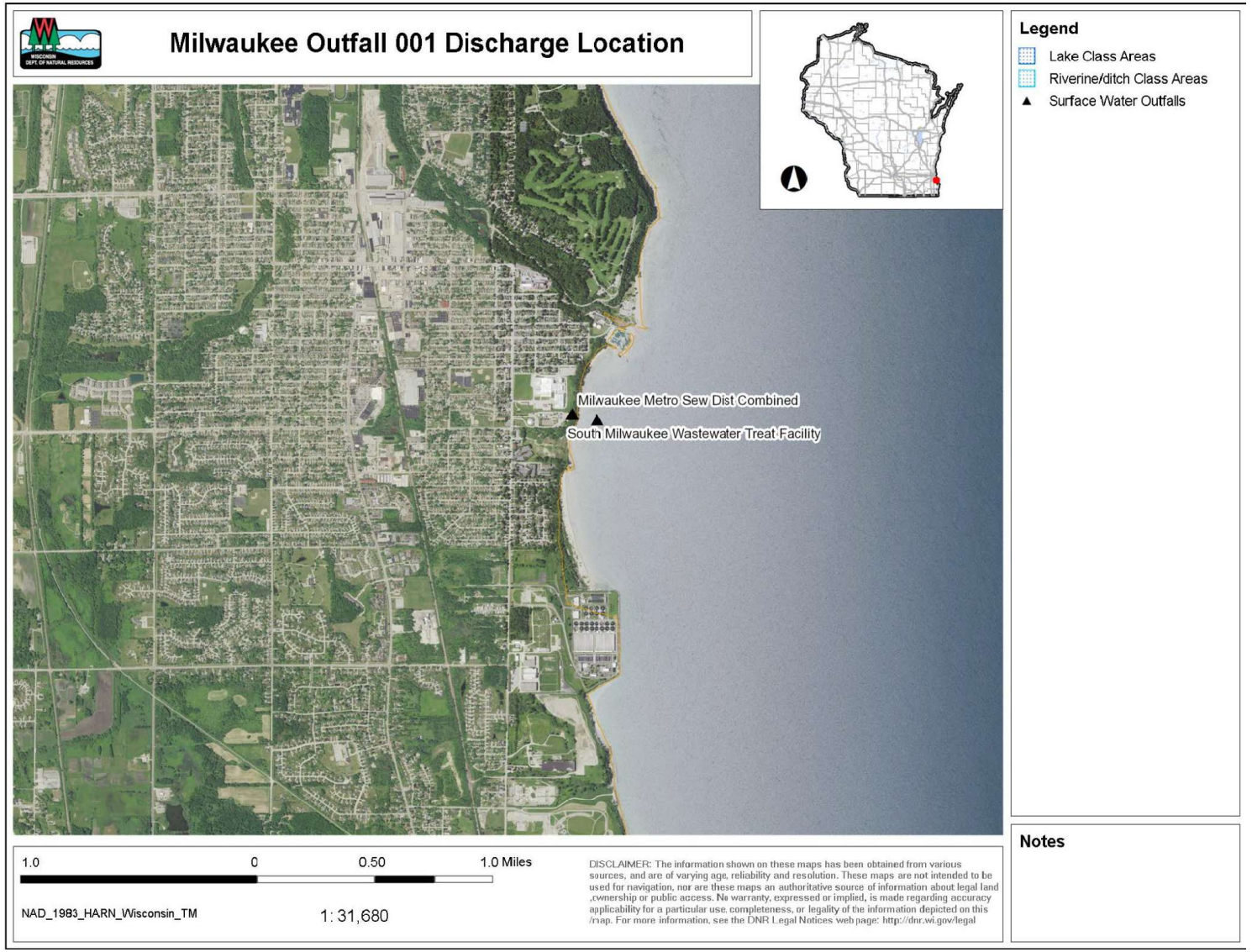
- This mixing zone and resulting WQBELs meet the requirements at 40 CFR, Part 132, Appendix F, Procedure 3 D., including that the actions will not jeopardize the continued existence of endangered or threatened species. The requirements for authorizing the exception and the circumstances under which it is being granted are essentially the same as those for granting a

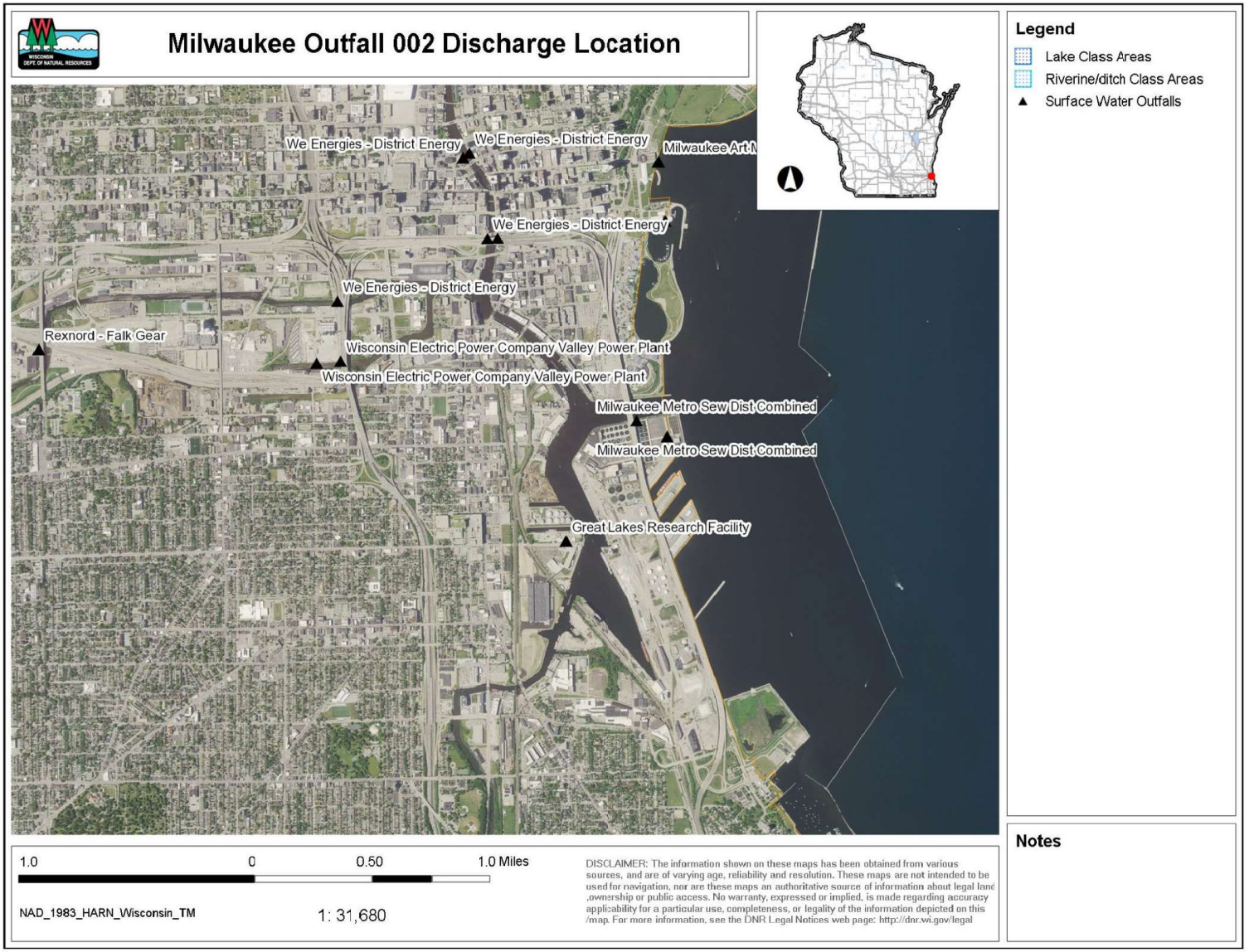
variance to water quality standards. WDNR has analyzed the potential impacts to endangered and threatened species as part of its variance process. The analysis concluded that approval of mercury variances, with more stringent permit requirements for PMPs, is unlikely to adversely affect bald eagles or other listed species that occur within the State of Wisconsin.

Therefore, WDNR grants a mixing zone extension for effluent discharges from the wastewater treatment facility operated by Milwaukee Met due to technical and economic considerations.

The granting of this exception to the Milwaukee Met shall apply only to the 5-year permit term of the proposed WPDES permit. The permittee will need to make a similar request and DNR will need to make a similar determination for a further continuation of a mixing zone, if those actions become appropriate for the next permit term.

Attachment #3




Milwaukee Outfall 002 Discharge Location
We Energies - District Energy
We Energies - District Energy
Milwaukee Art M
We Energies - District Energy
We Energies - District Energy
Rexnord - Falk Gear
Wisconsin Electric Power Company Valley Power Plant
Wisconsin Electric Power Company Valley Power Plant
Milwaukee Metro Sew Dist Combined
Milwaukee Metro Sew Dist Combined
Great Lakes Research Facility
Legend
Lake Class Areas
Riverine/ditch Class Areas
Surface Water Outfalls
Notes
1.0
0
0.50
1.0 Miles
NAD_1983_HARN_Wisconsin_TM
1: 31,680
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CORRESPONDENCE/MEMORANDUM

DATE: October 4, 2023 FILE REF: FIN 6555

TO: File

FROM: Zach Watson Hydrogeologist - SCR

SUBJECT: Groundwater Evaluation for Milwaukee Metropolitan Sewerage District Inline Storage System and Northwest Side Relief Sewer System WI-0036820-04

General Information and Treatment System Description

The Milwaukee Metro Sewerage District (MMSD) operates a wastewater Inline Storage System (ISS) and a Northwest Side Relief Sewer System (NWSRSS). The ISS and NWSRSS functions are to provide a mechanism for conveying and/or storing excessive wet weather flows to reduce the frequency and volume of Sanitary System Overflows (SSOs) and Combined Sewer Overflows (CSOs) that was historically discharged to area surface waters.

Since both the ISS and NWSRSS are installed within the states groundwater aquifer system the Department has imposed operational requirements on the ISS and NWSRSS both as conditions of plan approval and as permit requirements in previous permits. These requirements set a maximum operating level (maximum hydraulic pressure within the tunnels) for the system and required that a minimum higher pressure be maintained in the aquifer outside the tunnel walls, and that groundwater around the system be monitored for contamination. These conditions were consistent with the design and operation of the system as proposed by MMSD.

Under normal conditions groundwater leaks into the ISS. The estimated daily groundwater flow into the entire District system during dry conditions is approximately 3.3 MGD. Infiltration into the ISS causes a limited area of lower water pressure in the dolomite aquifer in the vicinity of the tunnel walls. When the tunnel is filled the water pressure in the tunnel may exceed the groundwater pressure surrounding the tunnel. To monitor the impact on groundwater there are forty wells installed along the tunnel system to measure groundwater levels. Monitoring of groundwater levels in the aquifer has shown that there are areas along the tunnel alignments where aquifer pressures have been exceeded near the tunnel walls by pressures generated inside the tunnel. This has resulted in possible exfiltration of wastewater from the tunnel. This wastewater subsequently returns as the tunnel is pumped out. To minimize the potential for exfiltration the department requires that a net positive head be maintained on the tunnel. Therefore, the permit requires the ISS be operated to limit storage to the -177.17 level MMSD datum (403.43 mean sea level MSL, Section 6.1.1 of the permit). Twenty of the forty wells are also monitoring the groundwater quality along the tunnel system. The groundwater quality design management zone for determining compliance of the two systems is 150 feet from the edge of both tunnels. Groundwater quality samples are to be collected from the monitoring wells associated with the ISS when the net positive head conditions are met (Section 6.1.2 of the permit). Groundwater quality samples are to be collected from the monitoring wells associated with the NWSRSS when the capacity of the NWSRSS has been reached (i.e., when the NWSRSS has reached 88 MG, Section 6.3.1 of the permit).

Groundwater Monitoring System for Depth to Groundwater and Groundwater Elevation (NWSRSS)

Parameter	Current and Proposed Permit WI-0036820-04/05				
	PAL	ES	Monitoring Frequency (0036820-04)	Monitoring Frequency (0036820-05)	Reporting Frequency
Depth to Groundwater	N/A	N/A	Daily	*Monthly	Monthly
Groundwater Elevation	N/A	N/A	Daily	*Monthly	Monthly
Peak Hourly Flow of NWSRSS	N/A	N/A	Daily	*Monthly	Monthly

*Changes from current permit

Groundwater Monitoring System for Depth to Groundwater and Groundwater Elevation (ISS)

Parameter	Current and Proposed Permit WI-0036820-04/05				
	PAL	ES	Monitoring Frequency (0036820-04)	Monitoring Frequency (0036820-05)	Reporting Frequency
Depth to Groundwater	N/A	N/A	Daily	*Monthly	Monthly
Groundwater Elevation	N/A	N/A	Daily	*Monthly	Monthly
Water Surface Elevation of Tunnel	N/A	N/A	Daily	*Monthly	Monthly
Net Positive Head	N/A	N/A	Daily	*Monthly	Monthly

*Changes from current permit

Groundwater Monitoring System for GW Quality - Northwest Side Relief Sewer

Parameter	Current and Proposed Permit WI-0036820-04/05	
	PAL	ES
Depth to Groundwater	N/A	N/A
Groundwater Elevation	N/A	N/A
Peak Hourly Volume of NWSRS	N/A	N/A
Nitrite+Nitrate nitrogen	2.0 mg/l	10 mg/l
Ammonia	0.97 mg/l	9.7 mg/l
Total Coliform General	0/100 ml	0/100 ml
Organic Nitrogen	N/A	N/A
Total Kjeldahl Nitrogen	N/A	N/A
Sulfate	125 mg/l	250 mg/l
Chloride	125 mg/l	250 mg/l

*All samples are collected per occurrence of full NWSRSS (88 MG).

Groundwater Monitoring System for GW Quality – Inline Storage System

Parameter	Current and Proposed Permit WI-0036820-04/05	
	PAL	ES
Depth to Groundwater	N/A	N/A
Groundwater Elevation	N/A	N/A
Water Surface Elevation of Tunnel	N/A	N/A
Net Positive Head	N/A	N/A
Nitrite+Nitrate nitrogen	2.0 mg/l	10 mg/l
Ammonia	0.97 mg/l	9.7 mg/l
Total Coliform General	0/100 ml	0/100 ml
Organic Nitrogen	N/A	N/A
Total Kjeldahl Nitrogen	N/A	N/A
Sulfate	125 mg/l	250 mg/l
Chloride	125 mg/l	250 mg/l

*All samples are collected per occurrence of Net Positive Head.

Monitoring Well Abandonment

As approved in the prior groundwater evaluation dated August 14, 2018, a total of 35 monitoring wells were abandoned during the period of April 4, 2019 – September 19, 2019. These monitoring wells and their abandonment date are provided as an attachment to this report. Additionally, monitoring wells 823, 801 and 819 were abandoned on January 2, 2021, September 6, 2022 and March 23, 2023, respectively.

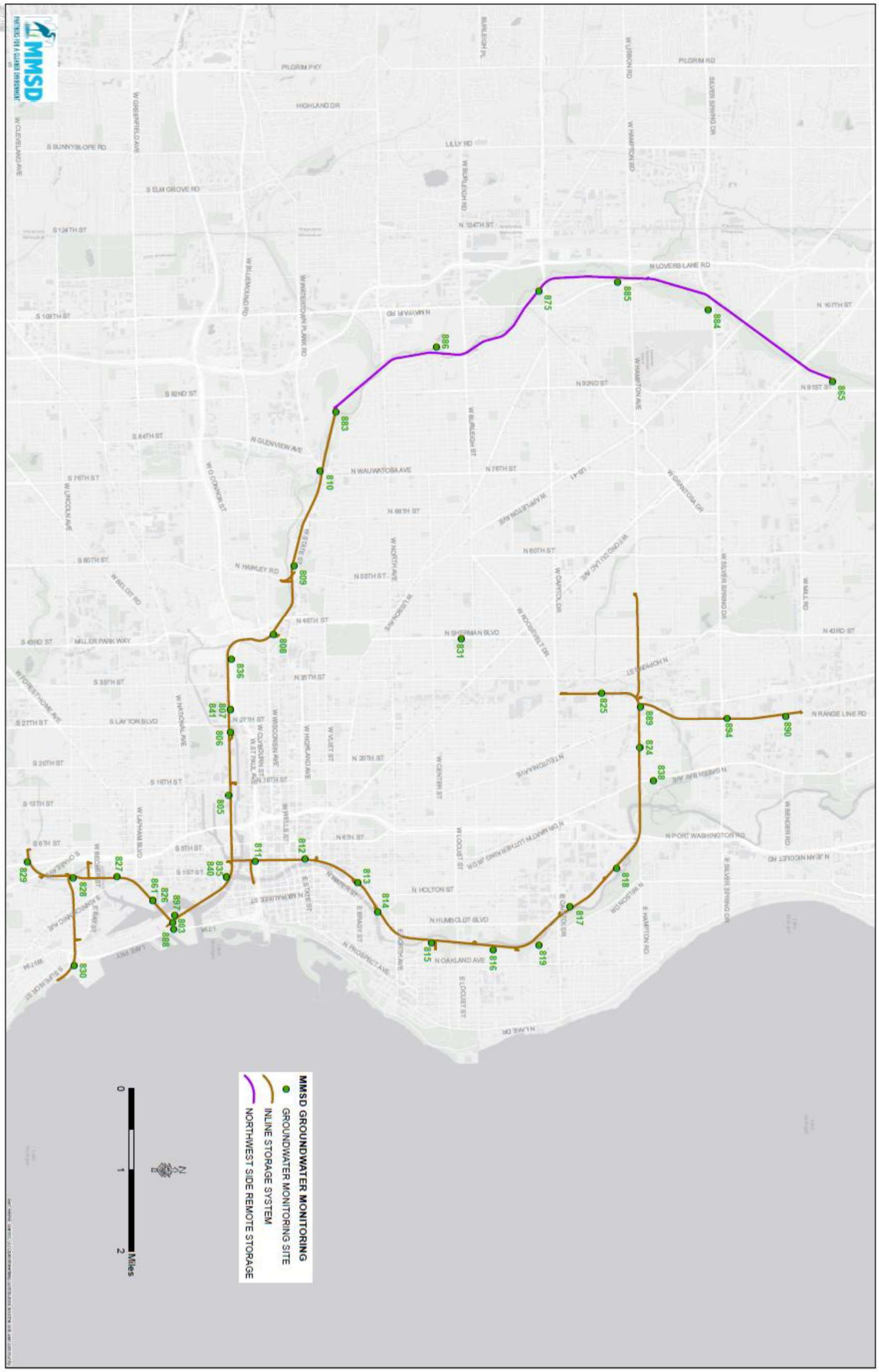
Groundwater Quality Sampling

During the current permit there were no instances of a net positive head violation and the MMSD Datum was never exceeded. There were seven CSO events during the current permit term. Groundwater quality samples were collected at NWSRSS Wells 884 and 885 for three of the seven events. There were three violations associated with the samples collected during these events. One result was for sulfate at monitoring well 884. The two other violations were for Total Coliform at monitoring wells 885 in May 2020 and at 884 in September 2022.

Conclusions, Recommendations and Schedule Requirements

- There were a small amount of CSOs during the current permit term. The reduction in CSOs resulted in few groundwater quality samples having been collected. The results from the few samples collected indicate minimal impact from these events on local groundwater quality.
- MMSD is proposing to reduce the sampling frequency at the monitoring wells with continuous data-loggers in section 6.2.1 of the permit from daily to monthly. This reduction in sample frequency is acceptable given that groundwater quality sampling is conditionally based and the dataset collected thus far is robust.

Figure 1 – Monitoring Well Location Map



DNR Well	date abandoned
820	6/27/19
821	6/27/19
822	6/27/19
834	7/18/19
837	6/27/19
839	9/9/19
842	7/9/19
843	5/14/19
844	8/30/19
845	8/23/19
846	5/7/19
847	6/5/19
848	7/9/19
849	4/9/19
851	6/26/19
852	7/23/19
853	6/7/19
854	8/13/19
855	8/13/19
856	4/24/19
862	6/7/19
864	8/8/19
869	5/14/19
871	6/14/19
873	7/2/19
874	7/24/19
876	7/31/19
877	7/31/19
882	8/1/19
887	7/9/19
891	5/31/19
892	4/24/19
893	8/7/19
895	9/19/19
896	6/26/19
898	4/4/19

Facility Specific Arsenic Variance Data Sheet

Directions: Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

Section I: General Information

A. Name of Permittee: Milwaukee Metropolitan Sewerage District (MMSD)

B. Facility Name: Milwaukee Metropolitan Sewerage District (MMSD)

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Arsenic **Date completed:** June 2, 2026

E. Permit #: WI-0036820-05-0 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** October 1, 2026 **End Date:** September 30, 2031

G. Date of Variance Application: December 30, 2024

H. Is this permit a: ☒ **First time submittal for variance**
☐ **Renewal of a previous submittal for variance** *(Complete Section X)*

Description of proposed variance: The Milwaukee Metropolitan Sewerage District (MMSD) discharges to Lake Michigan in Milwaukee County. MMSD seeks a variance to the water quality standard for arsenic for its South Shore WWTF (Outfall 001).

The Department concludes that MMSD has met the requirements of s. 283.15, Wisconsin Statutes. The Department therefore proposes that this permit include a discharger-specific variance to the arsenic water quality standard for human cancer.

The proposed variance for arsenic, from the water-quality based effluent limit (WQBEL) of 0.2 µg/L (as a monthly average) to an interim limit of 1.5 µg/L, is expressed as a daily maximum limit. The Department concludes that this interim limit reflects the greatest pollutant reduction achievable by the permittee with the pollutant control technologies currently applied at the WWTF. The permit requires the permittee to implement an arsenic Pollutant Minimization Program (PMP). The Department considers the highest attainable condition (HAC) of the receiving water to be the interim limits – applied for the term of the variance – combined with the permittee's implementation of the PMP. The term of the proposed variance is five years, concurrent with the term of the proposed WPDES permit. The underlying designated uses and criteria of Wisconsin's arsenic water quality standards (WQS) will be retained, and all other applicable WQS will remain in effect with adoption of the proposed variance.

This is a first-time submittal to EPA for an arsenic variance for this permittee.

Citation: An interim arsenic effluent limitation represents a variance to water quality standards authorized by s. 283.15, Wis. Stats., and 40 CFR §131.14.

I. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Amy Garbe	Amy.garbe@wisconsin.gov	(608)716-9968	Permit Drafter
Jacob Van Susteren-Wedesky	jacob.vansusterenwedesky@wisconsin.gov	(414)239-1480	Compliance Engineer
Nicole Krueger	Nicole.krueger@wisconsin.gov	(414)897-5750	Parts II D-H and J
Sarah Donoughe	Sarah.Donoughe@wisconsin.gov	(920)366-6076	Variance Coordinator

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: Arsenic, Human Cancer Criterion of 0.2 µg/L

B. List other criteria likely to be affected by variance: None

C. Source of Substance: Arsenic is naturally occurring in the surface water which is the main source of the municipal water supply for communities that discharge to MMSD. Average concentrations on the intake were calculated based on quarterly sampling results reported to the Department during the current permit term (2019-2024).

D. Ambient Substance Concentration: 0.81 µg/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

E. If measured or estimated, what was the basis? Include citation. Arsenic data was collected at Sampling Point 142 which is the raw city water intake.

F. Average effluent discharge rate: 113 MGD (annual average design flow) **Maximum effluent discharge rate:** 275 MGD (peak daily design flow)

G. Effluent Substance Concentration: 1-day P_{99} = 1.53 µg/L; 4-day P_{99} = 1.06 µg/L; 30-day P_{99} = 0.81 µg/L; Mean = 0.69 µg/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

H. If measured or estimated, what was the basis? Include Citation. Effluent arsenic concentrations were measured from Outfall 001 on a quarterly basis from 04/01/2019 – 05/31/2025.

I. Type of HAC:
☐ **Type 1: HAC reflects waterbody/receiving water conditions**
☐ **Type 2: HAC reflects achievable effluent conditions**
☒ **Type 3: HAC reflects current effluent conditions**

J. Statement of HAC: The Department has determined the highest attainable condition of the receiving water is achieved through the application of the variance limit in the permit, combined with a permit requirement that the permittee implement its Arsenic PMP. Thus, the HAC at commencement of this variance is 1.5 µg/L, which reflects the greatest arsenic reduction achievable with the current treatment processes, in conjunction with the implementation of the permittee's Arsenic PMP. The current effluent condition is reflective of on-site optimization measures that have already occurred. This HAC determination is based on the economic feasibility of available compliance options for the MMSD WWTF at this time (see Economic Section below). The permittee may seek to renew this variance in the subsequent reissuance of this permit; the Department will reevaluate the HAC in its review of such a request. A subsequent HAC cannot be defined as less stringent than this HAC.

K. Variance Limit: 1.5 µg/L as a daily maximum

L. Level Currently Achievable (LCA): 1.5 µg/L as a daily maximum

M. What data were used to calculate the LCA, and how was the LCA derived?
The LCA is equal to the 1-day P_{99} from quarterly monitoring from 04/01/2019 – 05/31/2025.

N. Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.
The variance limit = the 1-day P_{99}. The limit is established in accordance with s. 283.15(5), Wis. Stats., and ch. NR 106, Subchapter II, Wis. Adm. Code.

O. Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below: ☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5 ☐ 6
It has been determined that human caused conditions or sources of pollution prevent the attainment of the standard. See the attached analysis of arsenic in Lake Michigan and the discussion in Sections VI:C and VIII below.

Section III: Location Information

A. Counties in which water quality is potentially impacted: MMSD is located in Milwaukee County and discharges to Lake Michigan. There are 10 other Wisconsin counties that border Lake Michigan – Marinette, Oconto, Brown, Door, Kewaunee, Sheboygan, Ozaukee, Milwaukee, Racine and Kenosha – along with other bordering counties in the states of Illinois, Indiana and Michigan.

B. Receiving waterbody at discharge point: Lake Michigan

C. Flows into which stream/river? Lake Michigan **How many miles downstream?** N/A

D. Coordinates of discharge point (UTM or Lat/Long): 42.9012196, -87.8470107

E. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the chronic criterion of the substance for aquatic life protection?

The chronic arsenic criterion of 148 µg/L is not exceeded in the receiving water (Lake Michigan). The average of the available background data is 0.81 µg/L.

F. Provide the equation used to calculate that distance
N/A

G. What are the designated uses associated with the direct receiving waterbody, and the designated uses for any downstream waterbodies until the water quality standard is met?
Section NR 104.25, Wis. Adm. Code, Wisconsin-Michigan-Illinois-Indiana waters. Lake Michigan is used for recreation, commercial and recreational fishing, shipping, public water supply, waste assimilation, and industrial and cooling water. All Lake Michigan waters shall meet the standards for public water supplies and the standards for recreational use and fish and aquatic life, in addition to the thermal criteria contained in s. NR 102.04, Wis. Adm. Code.

H. Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on the waterbody:
See the "Arsenic Variances Along Lake Michigan Shoreline" map for locations. The effects of the combined variances are not expected to have an additive effect on the waterbody due to the large volume of water in Lake Michigan.

Permit Number	Facility Name	Facility Location	Variance Limit [mg/L]
0030848-08	Village of Cleveland	Southeast Manitowoc County	0.0045 mg/L daily max
0000914-08	Oak Creek Power Plant and Elm Road Generating Station	Milwaukee County	0.0012 mg/L daily max
0001589-09	WPL Edgewater	Sheboygan County	0.0047 mg/L daily max – outfall 004 0.0024 mg/L daily max – outfall 009

I. Please attach a map, photographs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet
See the "Arsenic Variances Along Lake Michigan Shoreline" map.

J. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below. ☒ **Yes** ☐ **No** ☐ **Unknown**

River Mile	Pollutant	Impairment
Mercury	Shorelines in Door, Kenosha, Kewaunee, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan	Contaminated Fish Tissue
PCBs	Shorelines in Door, Kenosha, Kewaunee, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan	Contaminated Fish Tissue
E. coli	Beaches in Kenosha, Kewaunee, Manitowoc, Milwaukee, Racine	Recreational Restrictions - Pathogens

Section IV: Pretreatment (complete this section only for POTWs with DNR-Approved Pretreatment Programs. See w:\Variances\Templates and Guidance\Pretreatment Programs.docx)

A. Are there any industrial users contributing arsenic to the POTW? If so, please list.
The District has limited data from sampling of certain industrial users' discharge and centralized waste treaters, and informal survey data identifying arsenic contributions from process wastewater from landfills and metalworking industries. In the proposed permit term, the District proposes to begin collecting the data needed to calculate the mass-balance of treatment system loadings for sources of arsenic and to discern the industrial/domestic contributions.

B. Are all industrial users in compliance with local pretreatment limits for arsenic? If not, please include a list of industrial users that are not complying with local limits and include any relevant correspondence between the POTW and the industry (NOVs, industrial SRM updates and timeframe, etc.)

There are currently 116 significant industrial users in MMSD's pretreatment program. In 2024, there were no violations of the 0.6 mg/L local limit.

C. When were local pretreatment limits for arsenic last calculated?
2003

D. Please provide information on specific SRM activities that will be implemented during the permit term to reduce the industry's discharge of the variance pollutant to the POTW:
MMSD proposes to begin collecting the data needed to calculate the mass-balance of treatment system loadings of arsenic for all sources and to establish the significance of industrial and commercial wastewater sources. Using the data gathered, MMSD can calculate the mass-balance and source classification of arsenic loading to support upgrading technology, education and outreach, and source reduction. Once MMSD has collected adequate data for a mass-balance calculation, MMSD will modify their local limits (MMSD Rules Chapter 11) and potentially reduce the local limits for arsenic.

Section V: Public Notice

A. Has a public notice been given for this proposed variance? ☒ Yes ☐ No

B. If yes, was a public hearing held as well? ☒ Yes ☐ No ☐ N/A

C. What type of notice was given?
☒ Notice of variance included in notice for permit
☐ Separate notice of variance

D. Date of public notice: June 10, 2026 **Date of hearing:** July 28, 2026

E. Were comments received from the public in regards to this notice or hearing? *(If yes, please attach on a separate sheet)* ☐ Yes ☐ No

Section VI: Human Health

A. Is the receiving water designated as a Public Water Supply? ☒ Yes ☐ No

B. Applicable criteria affected by variance: Public health and welfare

C. Identify any expected impacts that the variance may have upon human health, and include any citations:

Arsenic loading to Lake Michigan is complex, involving over 45,000 square miles of drainage area from four states, regional impacts and even global effects. Several interrelated and continually changing systems affect the lake including streamflow, storm water runoff, precipitation, groundwater flow, point source discharges, legacy contamination, air deposition, soil mobilization, and sedimentation; these systems impact the arsenic concentrations in the water column. Arsenic is widely distributed in the Earth's crust as various minerals in bedrock and soils. Terrestrial contributions of arsenic are high relative to atmospheric contributions because arsenic is largely associated with particles. Particulate arsenic likely deposits to land or water surfaces relatively near its source. In water, arsenic is mobile over a wide range of redox conditions and its tendency is to remain in a dissolved state at near neutral and alkaline pH values (Smedley & Kinniburgh, 2002).

Lake Michigan is fed by a vast network of rivers and streams. Baseline concentrations of arsenic in river waters vary according to the composition of the surface recharge, contribution from baseflow, and bedrock lithology. Relatively high concentrations of naturally occurring arsenic can occur in some areas as a result of inputs from geothermal sources or high-arsenic groundwaters. A large source of arsenic to river water is via groundwater. Concentrations of arsenic in groundwater are generally considered to be due to dissolution of arsenic from arsenic-bearing rocks (Smedley & Kinniburgh, 2002).

In areas of southeast Wisconsin and in some glaciated areas of Northern Wisconsin, arsenic is bound to iron oxide minerals in the aquifer sediments. In these settings, groundwater at depth is susceptible to elevated arsenic due to a lack of oxygen in the groundwater system. A USGS study of groundwater wells from 1973 to 2001 found that the arsenic concentration in at least 25% of samples in southeast Wisconsin exceeded 1.0-3.0 µg/L (USGS, 2001). Pumping of groundwater for uses like public drinking water likely exacerbates the release of arsenic to groundwater as redox conditions change with the change in groundwater level.

In considering the loading from individual point sources to the overall loading of arsenic to Lake Michigan through natural and anthropogenic sources, it is unlikely that water quality standards would be met in Lake Michigan if the

arsenic loading from this facility was suspended altogether. For this reason, this variance is not believed to have a significant impact on human health at this time. The results of individual permittees' actions in addition to pollution minimization efforts will also reduce any potential for negative impacts from the discharge. Additionally, the variance may help provide data and information that in general will help better define the scope and basis of the arsenic issues in Lake Michigan and actions that might be fruitful in reducing risk.

Citations: Hutchinson, T. C. and Meema, K. M. (Editors). Lead, Mercury, Cadmium and Arsenic in the Environment. Scope 31. John Wiley & Sons, Chichester, 1987; 360 pp.

Neff, Brian P. and Nicholas, J.R. Uncertainty in the Great Lakes Water Balance. Scientific Investigations Report 2004-5100. United States Geological Service, 2005.

Smedley, P.L. and Kinniburgh, D.G. "A Review of the Source, Behavior, and Distribution of Arsenic in Natural Waters." Applied Geochemistry 17 (2002) 517 – 568.

USGS National Water Quality Assessment Program. http://water.usgs.gov/nawqa/trace/arsenic/. Ryker, 2001. Retrieved November 2014.

Section VII: Aquatic Life and Environmental Impact

A. Aquatic life use designation of receiving water: Cold Water (CW) community

B. Applicable criteria affected by variance: Acute aquatic life toxicity = 340 µg/L
Chronic aquatic life toxicity = 148 µg/L

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:

Ambient arsenic concentrations in surface water resulting from the variance will be substantially less than levels that result in direct toxicity to aquatic organisms. EPA's current chronic aquatic life criterion for arsenic is 150 µg/L, which is approximately four orders of magnitude greater than the public health and welfare criteria (0.2 µg/L). Wisconsin's criteria are 340 µg/L and 148 µg/L for chronic and acute toxicity, respectively.

Although this variance will allow permitted dischargers additional time to identify and control sources of arsenic in their discharges, the pollutant minimization component of the variance should result in a net reduction in the amount of arsenic discharged to Wisconsin surface waters from permitted point sources further reducing risk to aquatic life and wildlife. In addition, the pollutant minimization programs for arsenic typically result in other pollution prevention efforts that have a beneficial indirect effect of reducing the use and production of products and processes that use or contribute arsenic to the environment. These efforts will also reduce any potential for negative impacts from the discharge. It is noted that a key source of arsenic pollution to Wisconsin's surface waters is atmospheric deposition from sources within and outside the State. Arsenic is also present in natural sources through soil and rock erosion. Given the magnitude of the arsenic loading from these sources, it is unlikely that arsenic water quality criteria would be met if the arsenic loading from this facility was suspended altogether. For these reasons, arsenic pollution from this discharge is believed to have a negligible impact on fish and aquatic life in Lake Michigan.

D. List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations:

The following are Endangered and Threatened Species in Milwaukee County, Wisconsin, from the Natural Heritage Inventory, May 2026:

MAMMALS
Big Brown Bat (T)
Little Brown Bat (T)
Northern Long-eared Bat (T)
Tricolored Bat (T)

BIRDS
Henslow's Sparrow (T)
Upland Sandpiper (T)
Red-shouldered Hawk (T)
Black Tern (E)
Acadian Flycatcher (T)
Peregrine Falcon (E)

Cerulean Warbler (T)
Hooded Warbler (T)

SNAILS
Cherrystone Drop (T)
Callused Vertigo (Hubricht's Vertigo) (E)

BEETLES
Hairy-necked Tiger Beetle (E)

FISHES
Redfin Shiner (T)

MUSSELS
Slippershell Mussel (T)
Monkeyface (T)
Ellipse (T)
Elktoe (P)

AMPHIBIANS
Blanchard's Cricket Frog (E)

PLANTS
Sand Reedgrass (T)
Shore Sedge (T)
Pitcher's Thistle (T)
Thickspike (T)
Clustered Broomrape (T)
Sand Dune Willow (E)
Snow Trillium (T)
Forked Aster (T)
Cooper's Milkvetch (E)
Prairie Dunewort (E)

REPTILES
Blanding's Turtle (P)

Citation: U.S. Fish & Wildlife Service – Environmental Conservation Online System (http://www.fws.gov/endangered/) and National Heritage Index (http://dnr.wi.gov/topic/nhi/)

Section VIII: Economic Impact and Feasibility

A. Describe the permittee's current pollutant control technology in the treatment process:
The South Shore Water Reclamation Facility consists of fine screening, grit removal, primary clarification, activated sludge aeration, secondary clarification, chlorination and dechlorination.

B. What modifications would be necessary to comply with the current limits? Include any citations.
Treatment processes used to treat water supplies for arsenic removal involve oxidation followed by filtration, and it would be these same treatment processes that potentially could be used to treat wastewater. EPA set the drinking water MCL for arsenic at 10 µg/L, as a concentration that approximates the lowest practicable level of treatment. The MCL is an order of magnitude higher than the arsenic WQBEL in this case, thus treatment to the level of the WQBEL is not technically achievable. Therefore, the Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible.

C. How long would it take to implement these changes?
The Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible.

D. Estimate the capital cost *(Citation)***:** N/A – this variance is not based on economic hardship. Therefore, financial costs are not part of the documentation for this variance.

E. Estimate additional O & M cost *(Citation)*: No technology supplier would guarantee their treatment technology to reliably treat for arsenic to 0.2 µg/L.

F. Estimate the impact of treatment on the effluent substance concentration, and include any citations:
As described above, 10 µg/L approximates the lowest practicable level of arsenic treatment in drinking water. That threshold may likely be higher in wastewater given the higher levels of suspended solids and organics found in wastewater effluent compared to drinking water. Since the arsenic concentration of the South Shore Water Reclamation Facility effluent is less than 10 µg/L, subjecting the effluent to an additional arsenic treatment process would likely have negligible effect on its arsenic concentration. Thus, the Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible.

G. Identify any expected environmental impacts that would result from further treatment, and include any citations:
While the Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible, the environmental impacts from that activity were nonetheless assessed. Arsenic treatment processes used to treat drinking water generate wastewater from backwashing filters and the arsenic removed during treatment is contained in the wastewater. In most cases that wastewater is discharged to the municipal WWTF. If such a treatment process were installed at MMSD, in which the arsenic removed from the drinking water would be discharged to the WWTF, the WWTF would receive the same amount of arsenic as it currently does, and thus there would be no expected change in the amount discharged from the WWTF.

Alternatively, if the wastewater from an arsenic treatment process were to be hauled from MMSD to another WWTF for disposal, much of the arsenic removed from treatment would be transferred to the receiving water of that WWTF. The South Milwaukee and Racine Wastewater Utility WWTFs are the two major (> 1 MGD) municipal WWTFs closest to MMSD, with the potential capability to accept such waste. However, since both of those WWTFs also discharge to Lake Michigan, there would be no change in the arsenic loading to Lake Michigan if either of those WWTFs accepted such waste from MMSD.

Other environmental impacts would include those from the additional electrical power that would need to be generated to operate an arsenic treatment process and from the additional air emissions generated if the wastewater was transported to another WWTF for disposal.

H. Is it technically and economically feasible for this permittee to modify the treatment process to reduce the level of the substance in the discharge? ☐ **Yes** ☐ **No** ☒ **Unknown**
The Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible. It is unknown if modifications to the treatment process to reduce the level of arsenic in the discharge (but not to the level of the WQBEL) are technically and economically feasible.

I. If treatment is possible, is it possible to comply with the limits on the substance? ☐ **Yes** ☒ **No** ☐ **Unknown**

J. If yes, what prevents this from being done? Include any citations.
N/A – see discussion above.

K. List any alternatives to current practices that have been considered, and why they have been rejected as a course of action, including any citations:
It is premature, as well as likely infeasible, at this stage to consider implementing technology at the South Shore Water Reclamation Facility to remove or reduce arsenic during the treatment process. MMSD currently does not have any controls for arsenic nor any data on plant operations that may impact arsenic in effluent or biosolids. There are no known additional controls MMSD could implement to reduce arsenic discharges during the proposed permit term.

Section IX: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.
The current treatment system at the South Shore Water Reclamation Facility and planned implementation of the PMP are the only activities being conducted for reducing this specific pollutant.

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

As conditions of this variance the proposed permit requires the permittee to (a) maintain effluent quality at or below the current effluent concentrations, (b) implement the arsenic Pollutant Minimization Program (PMP) plan, and (c) perform the actions listed in the Arsenic Pollutant Minimization Program Schedule (see the Schedules section of the proposed permit).

PMP activities include:

1. Develop a sampling plan, collect influent data, collect effluent data and monitor drinking water.
2. Evaluate the feasibility of adding an arsenic treatment system.
3. Submit annual progress reports on data collected and PMP implementation.

Citation: MMSD's Arsenic Variance Application and Pollutant Minimization Program (PMP) plan

Section X: Compliance with Previous Permit *(Variance Reissuances Only)*

A. Date of previous submittal: N/A **Date of EPA Approval:** N/A

B. Previous Permit #: N/A **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: N/A **Variance Limit:** N/A

D. Target Value(s): N/A **Achieved?** ☐ **Yes** ☐ **No** ☐ **Partial**

E. For renewals, list previous steps that were to be completed. Show whether these steps have been completed in compliance with the terms of the previous variance permit. Attach additional sheets if necessary.

Condition of Previous Variance	Compliance
N/A – first time submittal for variance	☐ **Yes** ☐ **No**

Arsenic Variance Application and Pollutant Minimization Program Plan

The Milwaukee Metropolitan Sewerage District (District) requests a variance pursuant to Wis. Stat. § 283.15 from the water quality standard to derive the water quality based effluent limitation for arsenic at Outfall 001 for the South Shore Water Reclamation Facility (SS) located at 8500 South Fifth Avenue, Oak Creek, Wisconsin 53154, under Wisconsin Pollutant Discharge Elimination System (WPDES) permit number WI-0036820-05-0. In lieu of the 0.2 µg/L limitation required based on wildlife criteria under Wis. Admin. Code § NR 106.06(6)(c)1, the District requests an alternative arsenic limitation of 1.5 µg/L for Outfall 001. The basis for the District's request for variance is that attaining the water quality standard is not feasible because human-caused conditions or sources of pollution prevent the attainment of the standard and cannot be remedied or would cause more environmental damage to correct than to leave in place pursuant to Wis. Stat. § 283.15(4)(a)1.c.

Arsenic occurs naturally in the environment and background concentrations in Lake Michigan are known to be elevated. In 2023, Milwaukee Water Works recorded Lake Michigan source water quality at a median concentration of 0.73 µg/L (and a maximum measured concentration of 0.85 µg/L).[1] Effluent data from the last five years at SS show an average concentration discharged into Lake Michigan of 0.67 µg/L. *See Figure 1.* The District certainly cannot remedy these exceedances of water quality standards in the lake, but it also cannot immediately meet an effluent limitation of 0.2 µg/L at SS. Instead, the District proposes a multifaceted approach comprised of additional sampling and monitoring, mass-balance assessment of treatment system loadings, implementation of new metals analysis technology, education and targeted outreach, and ultimately responsive modification of discharge regulations in District Rules.

The District does not presently have sufficient data for a mass-balance calculation of treatment system loadings of arsenic for all sources nor adequate information to establish the significance of industrial and commercial wastewater sources versus domestic wastewater sources. The District has limited data from sampling of certain industrial users' discharge and centralized waste treaters, and informal survey data identify arsenic contributions from process wastewater from landfills and metalworking industries. To approximate the mass-balance analysis, the District would need an adequate sample size that includes domestic sources, including wastewater derivative from private and municipal groundwater well sources.

[1] 2023 CITY OF MILWAUKEE, MILWAUKEE WATER WORKS, LAKE MICHIGAN SOURCE WATER QUALITY, https://city.milwaukee.gov/ImageLibrary/Groups/WaterWorks/Consumer-Confidence-Reports/2023-Lake-Michigan-Source-Water-Quality.pdf.

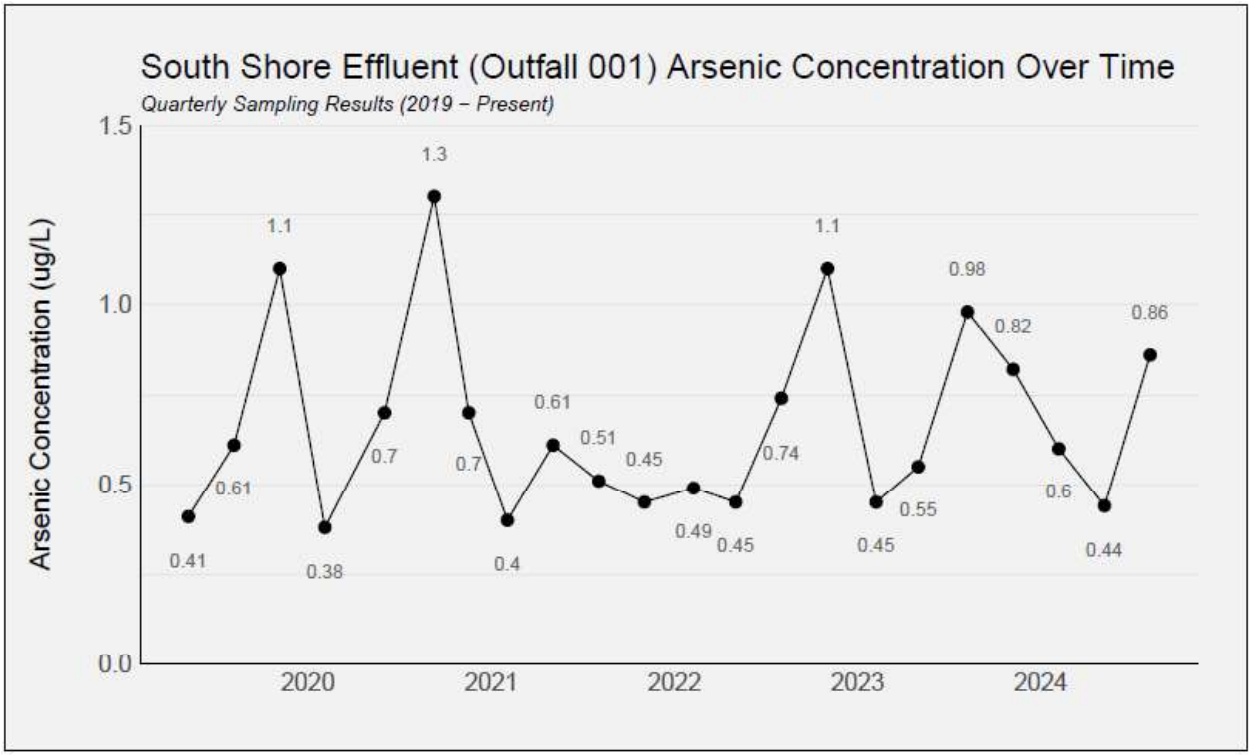


Figure 1

In the next permit term, the District proposes to begin collecting the data needed to calculate the mass-balance of treatment system loadings for sources of arsenic and to discern the industrial/domestic contributions. This would entail additional sampling of SS influent and at conveyance system connections to the DNR-identified municipalities with non-Lake Michigan water sources and a significant enough volume of groundwater discharged as wastewater to SS. The additional sampling of influent would be done daily (matching the frequency at which the District currently tests for other metals), while the conveyance locations would be done at the same frequency as current arsenic sampling at industrial sites, which is three times per year. For centralized waste treaters, sampling would remain monthly. The District will continue regular sampling at the targeted industrial sites and may broaden the data collection to include additional sites as appropriate. Using the data gathered, the District will calculate and report to DNR the mass-balance and source classification for arsenic loading and begin a pollutant minimization program of upgrading technology, education and outreach, and source reduction.

The District's current method technology housed in the central laboratory cannot produce results that can be quantified down to 0.2 µg/L, so quantifying to a limitation this low will require sending samples to a contract laboratory offsite. The District intends to buy a new metal analyzer for its laboratory, which is expected to be operational by June 2026 and may resolve the occasional issue encountered with lanthanum, a rare earth metal that can trigger an arsenic reading interference. Additional and more precise data will also allow the District to focus its education and outreach to relevant sources within the service area. As mentioned, preliminary informal data indicate that, of the District's permitted sites sampled, landfills and metalworking

industries are likely considerable sources. With more data, the District will be able to identify relevant sources, alert them of new the new limitation, and give them time to prepare for possible changes in District Rules. The District will provide annual reports to the DNR.

Once the District has ascertained adequate data to calculate the mass-balance of treatment system loadings and identify major sources of arsenic, the District will modify the Discharge Regulations and Enforcement Procedures codified in District Rules Chapter 11, as appropriate.[2] The current local concentration limit for user discharge of process wastewater into the sewerage system is 0.6 mg/L for total arsenic, a unit several orders of magnitude greater than micrograms per liter (µg/L). Additionally, users may discharge 0.6 mg/L *plus* the concentration of the pollutant in the water supply if the user simultaneously samples the water supply and discharges to the sewerage system.[3] Depending on what the data and calculations show, it may be appropriate for the District to undertake formal rulemaking and reduce these limits in discharges to the sewerage system.

It is premature as well as likely infeasible at this stage to consider implementing technology at SS to remove or reduce arsenic during the treatment process. The District currently does not have any controls for arsenic nor any data on plant operations that may impact arsenic in effluent or biosolids. There are no known additional controls the District could implement to reduce arsenic discharges in the term of the next permit. Concurrent with education and outreach, the best approach is source reduction. To achieve the greatest reduction, the District will target its efforts based on the data collection described above.

[2] MMSD Rules Chapter 11, available at https://www.mmsd.com/application/files/4515/1690/7351/Chapter_11_January_2018.pdf.
[3] *Id.* at Section 11.213(2).

Arsenic Variance Application and
Pollutant Minimization Program Plan – Action Items by Permit Year

	Permit Year						
PMP Action Item	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Anticipated Outcome**	**Reporting**
Collect Data	Develop sampling plan based on targeted potential sources and begin sampling all industries to establish a baseline	Sample	Sample	Sample	Sample	Calculate a mass balance of treatment system loading sources	The PMP annual reports will include the sampling plan and sample results.
Purchase and use new metal analyzer	Purchase	Use	Use	Use	Use	Additional and more precise data	The PMP annual reports will document the purchase and use of the new analyzer and make conclusions on the effectiveness.
Submit annual reports to DNR	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Document PMP activities and monitoring data from the past year	The PMP annual reports will be detailed and provide information on the effectiveness of PMP activities and any follow-up actions taken.
Investigate arsenic technology	Research arsenic treatment technologies such as oxidation, coagulation/flocculation, membranes, adsorption, and ion exchange	Start a planning study to analyze the different technologies, evaluate feasibility and/or conduct pilot studies, and determine the best treatment technology if source reduction is ineffective	Continue planning study and pilots	Continue planning study and pilots	Compile research findings into final report on available technology, probable effectiveness, and feasibility	Determine if arsenic treatment technology is available, effective, and feasible	The PMP annual reports will document which treatment technologies were investigated and conclusions on feasibility of implementation including cost evaluation and effectiveness.
Modify discharge regulations	(Data collection)	(Data collection)	(Data collection)	Draft new discharge regulations (if appropriate)	Enact new discharge regulations (if appropriate)	Reduce treatment system loadings	The PMP annual reports will document why new discharge regulations are or are not appropriate in response to data collected.
Education	Develop educational materials for industrial, commercial, and/or residential sewer users starting with background on arsenic and local limits	Develop materials targeting industrial dischargers with follow-up as more data collected and sources confirmed	Continue targeted outreach of industrial dischargers and provide information about treatment options	Notify potentially affected industries of District intent to update discharge regulations (if appropriate)	Ongoing work with the industries to become compliant and install treatment	Educate stakeholders and industries about compliance with discharge regulations for arsenic	The PMP annual reports will document what educational materials have been distributed and at what method and frequency.
Targeted Source Reduction	Identify potential sources, collect data, confirm sources, enforce regulations. Potential industrial sources include: landfills, nonferrous metals forming, metal forming, metal powders, electroplating, centralized waste treaters, and industrial laundries.	Identify potential sources, collect data, confirm sources, enforce regulations.	Identify potential sources, collect data, confirm sources, enforce regulations	Identify potential sources, collect data, confirm sources, enforce regulations	Identify potential sources, collect data, confirm sources, enforce regulations	Reduce arsenic loadings to District conveyance and treatment systems	The PMP annual reports will document any sources the District identifies as arsenic dischargers.

Facility Specific Variance Data Sheet

Directions: Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

Section I: General Information

A. Name of Permittee: Milwaukee Metropolitan Sewerage District (MMSD)

B. Facility Name: Milwaukee Metropolitan Sewerage District (MMSD)

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Bacteria/CSO **Date completed:** June 2, 2026

E. Permit #: WI-0036820-05-0 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** October 1, 2026 **End Date:** September 30, 2031

G. Date of Variance Application: December 30, 2024

H. Is this permit a: ☒ **First time submittal for variance**
☐ **Renewal of a previous submittal for variance** *(Complete Section X)*

Description of proposed variance: The Milwaukee Metropolitan Sewerage District (MMSD) discharges to Lake Michigan in Milwaukee County. MMSD seeks a variance to the water quality standard for bacteria for its combined sewer overflow (CSO) locations. The conveyance system has 114 CSO outfalls to Lake Michigan and the Milwaukee, Menomonee, and Kinnickinnic Rivers and their tributaries.

The Department concludes that MMSD has met the requirements of s. 283.15, Wisconsin Statutes. The Department therefore proposes that this permit include a discharger-specific variance to the bacteria water quality standard for recreational use.

Older cities in the United States such as Milwaukee, were designed to convey stormwater and sewage in the same pipes to wastewater treatment plants. However, the pipes could not convey all of the water during heavy rainstorms, and to avoid sewage backups into homes, these combined sewers included relief points known as combined sewer overflows, where the pipes would overflow releasing untreated sewage into the environment. Reducing or eliminating these overflows is complicated and costly.

The District has endeavored to control CSOs and abate water pollution since as early as the 1970s. The District's monitoring program for CSOs began in 1989, and, in 1994, the inline storage system (ISS), a 19-mile network of storage tunnels, went into full operation, expanding the sewerage system's capacity by approximately 405 million gallons. In 2006, the District further expanded its capacity with the Northwest Side Relief Sewer, a 7-mile, 20-foot-diameter tunnel that can function either as a storage facility or a relief sewer. In 2010, 27 million gallons of capacity were added to the system with the North 27th Street addition to the ISS.

This is a first-time submittal to EPA for a bacteria variance for this permittee.

Citation: An interim bacteria effluent limitation represents a variance to water quality standards authorized by s. 283.15, Wis. Stats., and 40 CFR §131.14.

I. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Amy Garbe	Amy.garbe@wisconsin.gov	(608)716-9968	Permit Drafter
Jacob Van Susteren-Wedesky	jacob.vansusterenwedesky@wisconsin.gov	(414)239-1480	Compliance Engineer
Nicole Krueger	Nicole.krueger@wisconsin.gov	(414)897-5750	Limit Calculator
Sarah Donoughe	Sarah.Donoughe@wisconsin.gov	(920)366-6076	Variance Coordinator

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: Bacteria (E. coli), Recreational Use Standard 126 #/100 mL

B. List other criteria likely to be affected by variance: None.

C. Source of Substance: CSOs contain domestic sewage as well as stormwater that has collected pollutants from urban runoff and animal and yard waste.

D. Ambient Substance Concentration: ~83,000 MPN/100 mL ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

E. If measured or estimated, what was the basis? Include citation. E. coli concentrations during CSO events were monitored by the District. The average of the median sample results from March 2019 through April 2024 equates to ~83,000 MPN/100 mL. Since there is currently no treatment on the CSO outfalls, the ambient concentration is equal to the CSO outfall results.

F. Average effluent discharge rate: 113 MGD (annual average design flow) **Maximum effluent discharge rate:** 275 MGD (peak daily design flow)

G. Outfall Substance Concentration: ~83,000 MPN/100 mL ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

H. If measured or estimated, what was the basis? Include Citation. E. coli concentrations during CSO events were monitored by the District. The average of the median sample results from March 2019 through April 2024 equates to ~83,000 MPN/100 mL.

I. Type of HAC:
☐ **Type 1: HAC reflects waterbody/receiving water conditions**
☐ **Type 2: HAC reflects achievable effluent conditions**
☒ **Type 3: HAC reflects current effluent conditions**

J. Statement of HAC: The Department has determined the highest attainable condition of the receiving water is achieved through the application of permit requirements including implementation of the Nine Minimum Controls, actions to address I/I from MMSD and community sewer systems, and CSO abatement projects. These collective actions, and the variance conditions noted below, are intended to achieve the highest attainable CSO control conditions feasible during the course of the variance. The permittee may seek to renew this variance in the subsequent reissuance of this permit; the Department will reevaluate the HAC in its review of such a request. A subsequent HAC cannot be defined as less stringent than this HAC.

K. Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below: ☐ **1** ☐ **2** ☒ **3** ☐ **4** ☐ **5** ☐ **6**

It has been determined that human caused conditions or sources of pollution prevent the attainment of the standard and the Department considers treating to produce effluent at concentrations to meet the limit to be technically and economically infeasible. See the discussion in Sections VI:C and VIII below.

Section III: Location Information

A. Counties in which water quality is potentially impacted: MMSD is located in Milwaukee County and discharges to Lake Michigan. There are 10 other Wisconsin counties that border Lake Michigan – Marinette, Oconto, Brown, Door, Kewaunee, Sheboygan, Ozaukee, Milwaukee, Racine and Kenosha – along with other bordering counties in the states of Illinois, Indiana and Michigan.

B. Receiving waterbody at discharge point: Lake Michigan

C. Flows into which stream/river? Lake Michigan **How many miles downstream?** N/A

D. Coordinates of discharge point (UTM or Lat/Long): 42.9012196, -87.8470107

E. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the chronic criterion of the substance for aquatic life protection?
N/A

F. Provide the equation used to calculate that distance
N/A

G. What are the designated uses associated with the direct receiving waterbody, and the designated uses for any downstream waterbodies until the water quality standard is met?
Section NR 104.25, Wis. Adm. Code, Wisconsin-Michigan-Illinois-Indiana waters. Lake Michigan is used for recreation, commercial and recreational fishing, shipping, public water supply, waste assimilation, and

industrial and cooling water. All Lake Michigan waters shall meet the standards for public water supplies and the standards for recreational use and fish and aquatic life, in addition to the thermal criteria contained in s. NR 102.04, Wis. Adm. Code.

H. Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on the waterbody:
N/A – the only other combined sewer service area in Wisconsin is located in the City of Superior.

I. Please attach a map, photographs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet
See the "Arsenic Variances Along Lake Michigan Shoreline" map.

J. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below. ☒ **Yes** ☐ **No** ☐ **Unknown**

River Mile	Pollutant	Impairment
Mercury	Shorelines in Door, Kenosha, Kewaunee, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan	Contaminated Fish Tissue
PCBs	Shorelines in Door, Kenosha, Kewaunee, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan	Contaminated Fish Tissue
E. coli	Beaches in Kenosha, Kewaunee, Manitowoc, Milwaukee, Racine	Recreational Restrictions - Pathogens

Section V: Public Notice

A. Has a public notice been given for this proposed variance? ☒ **Yes** ☐ **No**
B. If yes, was a public hearing held as well? ☒ **Yes** ☐ **No** ☐ **N/A**
C. What type of notice was given? ☒ **Notice of variance included in notice for permit**
☐ **Separate notice of variance**
D. Date of public notice: June 10, 2026 **Date of hearing:** July 28, 2026
E. Were comments received from the public in regards to this notice or hearing? *(If yes, please attach on a separate sheet)* ☐ **Yes** ☐ **No**

Section VI: Human Health

A. Is the receiving water designated as a Public Water Supply? ☒ **Yes** ☐ **No**
B. Applicable criteria affected by variance: Recreational Use

C. Identify any expected impacts that the variance may have upon human health, and include any citations:

Combined Sewer Overflows (CSOs) should be considered similarly to untreated sewage in terms of public health concern. Addressing the public health significance of CSOs is problematic because of the site-specific nature of the extent to which they vary by site characteristics. Some CSOs discharge infrequently, while others discharge every time it rains. Overflow frequency and duration varies from system to system and from outfall to outfall. Because CSOs contain untreated wastewater and storm water, they contribute microbial pathogens and other pollutants to surface waters. CSOs can impact the environment and human health. Specifically, CSOs can cause or contribute to water quality impairments, beach closures, contamination of drinking water supplies, and other environmental and human health problems.

CSO discharges include a mix of domestic, commercial and industrial wastewater, and storm water runoff. The principal pollutants found in CSOs are microbial pathogens, oxygen-depleting substances, total suspended solids, toxics, nutrients, floatables and trash. Pollutant concentrations in CSOs vary substantially based on weather conditions, the characteristics of the sewer system, the service population, the treatment provided to the CSO, and other factors.

EPA documented that CSOs cause human health and environmental impacts in two national assessments of CSOs: Report to Congress—Implementation and Enforcement of the Combined Sewer Overflow Control Policy (EPA 2001b) and Report to Congress—Impacts and Control of CSOs and SSOs (EPA 2004b). EPA found that pollutant

concentrations in CSOs may be sufficient to cause violations of water quality standards, precluding the attainment of one or more of the designated uses (e.g., recreation or drinking water supply) for the waterbody. CSOs often discharge simultaneously with storm water, wet weather sanitary sewer overflows (SSOs), and other nonpoint sources of pollution. This can make it difficult to identify and assign specific cause-and-effect relationships between CSOs and observed water quality problems.

In Wisconsin, MMSD operates the only Combined Sewer System (CSS) in the Lake Michigan basin. MMSD's CSOs discharge to, or in close proximity to, 303(d)-impaired waters where pathogens and/or dissolved oxygen have been cited as reasons or causes of impairment. MMSD constructed a large inline storage system (ISS) to store and convey wet weather flows that has significantly reduced CSOs. For most wet weather events, MMSD's combined sewer flows are captured by the ISS, where they are stored until they can be pumped to one of the treatment plants for treatment. CSOs occur during very large wet weather events when there is not enough storage capacity in the ISS.

In considering the loading from individual point sources to the overall loading of bacteria to Lake Michigan through natural and anthropogenic sources, it is unlikely that water quality standards would be met in Lake Michigan if the bacteria loading from this facility was suspended altogether. For this reason, this variance is not believed to have a significant impact on human health at this time. The results of the individual permittees' actions in addition to pollution minimization efforts will also reduce any potential for negative impacts from the discharge.

Citations: Combined Sewer Overflows to the Lake Michigan Basin, USEPA, Office of Water (4203), Washington, DC 20460, EPA-833-R-07-007, September 2007

Disinfection Requirements for Discharges to Surface Waters, Wisconsin Department of Natural Resources, Bureau of Water Quality, Program Guidance EGAD Number: 3400-2024-03, July 8, 2024

Section VII: Aquatic Life and Environmental Impact

A. Aquatic life use designation of receiving water: Lake Michigan, Cold Water (CW) community; and the Milwaukee, Menomonee, and Kinnickinnic Rivers and their tributaries, Warm Water Sport Fish (WWSF)

B. Applicable criteria affected by variance: N/A

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:

N/A – recreational use criteria only.

D. List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations:

The following are State Endangered and Threatened Species in Milwaukee County, Wisconsin, from the Natural Heritage Inventory, May 2026:

MAMMALS
Big Brown Bat (T)
Little Brown Bat (T)
Northern Long-eared Bat (T)
Tricolored Bat (T)

BIRDS
Henslow's Sparrow (T)
Upland Sandpiper (T)
Red-shouldered Hawk (T)
Black Tern (E)
Acadian Flycatcher (T)
Peregrine Falcon (E)
Cerulean Warbler (T)
Hooded Warbler (T)

SNAILS
Cherrystone Drop (T)
Callused Vertigo (Hubricht's Vertigo) (E)

BEETLES
Hairy-necked Tiger Beetle (E)

FISHES
Redfin Shiner (T)

MUSSELS
Slippershell Mussel (T)
Monkeyface (T)
Ellipse (T)
Elktoe (P)

AMPHIBIANS
Blanchard's Cricket Frog (E)

PLANTS
Sand Reedgrass (T)
Shore Sedge (T)
Pitcher's Thistle (T)
Thickspike (T)
Clustered Broomrape (T)
Sand Dune Willow (E)
Snow Trillium (T)
Forked Aster (T)
Cooper's Milkvetch (E)
Prairie Dunewort (E)

REPTILES
Blanding's Turtle (P)

Citation: U.S. Fish & Wildlife Service – Environmental Conservation Online System (http://www.fws.gov/endangered/) and National Heritage Index (http://dnr.wi.gov/topic/nhi/)

Section VIII: Economic Impact and Feasibility

A. Describe the permittee's current pollutant control technology in the treatment process:
The conveyance system has 114 CSO outfalls to Lake Michigan and the Milwaukee, Menomonee, and Kinnickinnic Rivers and their tributaries. The deep tunnel system encompasses nearly 430 million gallons of storage capacity but does not include primary treatment or disinfection.

B. What modifications would be necessary to comply with the current limits? Include any citations. In order to comply, either no CSO events would need to occur or prior to all 114 overflow outfalls, primary treatment and disinfection would need to occur.

C. How long would it take to implement these changes?
The Department considers treatment of the CSO outfalls to produce effluent to meet the bacteria recreational use standard to be technically infeasible.

D. Estimate the capital cost *(Citation)***:** N/A – this variance is not based on economic hardship. Therefore, financial costs are not part of the documentation for this variance.

E. Estimate additional O & M cost *(Citation)***:** N/A – this variance is not based on economic hardship. Therefore, financial costs are not part of the documentation for this variance.

Section IX: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.

MMSD has been performing actions related to implementation of the Nine Minimum Controls dating back to the 1980s as part of their long term control plan. The previous permit required submittal of Wet Weather Management Biannual Reports which have been continued in the proposed permit term.

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

The proposed permit includes language within Section 4 related to implementation of the Nine Minimum Controls, actions to address I/I from MMSD and community sewer systems, and CSO abatement projects. Additionally, the District's 2050 Facilities Plan (approved in 2021) includes implementation projects related to its Nine Minimum Control plan.

Citation: MMSD's Bacteria Variance Application and Pollutant Minimization Program (PMP) plan

Section X: Compliance with Previous Permit *(Variance Reissuances Only)*

A. Date of previous submittal: N/A **Date of EPA Approval:** N/A

B. Previous Permit #: N/A **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: N/A **Variance Limit:** N/A

D. Target Value(s): N/A **Achieved?** ☐ **Yes** ☐ **No** ☐ **Partial**

E. For renewals, list previous steps that were to be completed. Show whether these steps have been completed in compliance with the terms of the previous variance permit. Attach additional sheets if necessary.

Condition of Previous Variance	Compliance
N/A – first time submittal for variance	☐ **Yes** ☐ **No**

Bacteria Variance Application and Pollutant Minimization Program Plan

The Milwaukee Metropolitan Sewerage District (District) requests a variance pursuant to Wis. Stat. § 283.15 from the requirements of Wis. Stat. § 283.13(4)(c) in reissuance of its Wisconsin Pollutant Discharge Elimination System (WPDES) permit number WI-0036820-05-0. A variance for bacteria at all permitted combined sewer overflow (CSO) outfalls is warranted under Wis. Stat. § 283.15(4)(a)1.c[1] because, though the District has fundamentally reduced the number of CSOs, the remaining few anticipated annual CSOs cannot comply with water quality standards compatible with recreational use, and, as a practical matter, the elimination of CSOs is infeasible because doing so would preclude implementation of alternatives that may result in a greater environmental benefit. As described below, the District proposes to satisfy this variance by implementing wet weather management programs according to the outlined coordinated frameworks for achieving greater environmental, social, and economic benefits.

The District has endeavored to control CSOs and abate water pollution since as early as the 1970s, when dedicated planning and programming began.[2] The District's monitoring program for CSOs began in 1989, and, in 1994, the inline storage system (ISS), a 19-mile network of storage tunnels, went into full operation, expanding the sewerage system's capacity by approximately 405 million gallons. In 2006, the District further expanded its capacity with the Northwest Side Relief Sewer, a 7-mile, 20-foot-diameter tunnel that can function either as a storage facility or a relief sewer. In 2010, 27 million gallons of capacity were added to the system with the North 27th Street addition to the ISS. Pursuant to the United States Environmental Protection Agency (EPA) CSO Control Policy,[3] the District has implemented the nine minimum controls for correction of combined sewer overflows thanks in large part to these and other major capacity projects.[4] Since that time, the number, volume, and duration of system-wide CSOs have been significantly reduced from 50-60 annually to only one or two CSOs of much smaller volume per year. *See Figures 1 and 2.*

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[1] 40 C.F.R. § 131.10(g)(3) or "Factor 3."

[2] *See* MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, CSO LONG-TERM CONTROL PLAN INCLUDED AS APPENDIX 10A TO THE 2020 FACILITIES PLAN, https://www.mmsd.com/application/files/1914/8226/3107/2020_Chapter_10_Appendix_A_Binder1.pdf.

[3] Codified in the Clean Water Act, 33 U.S.C. § 1342(q)(1).

[4] *See* MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, DOCUMENTATION OF IMPLEMENTATION OF THE NINE MINIMUM COMBINED SEWER OVERFLOW CONTROLS.

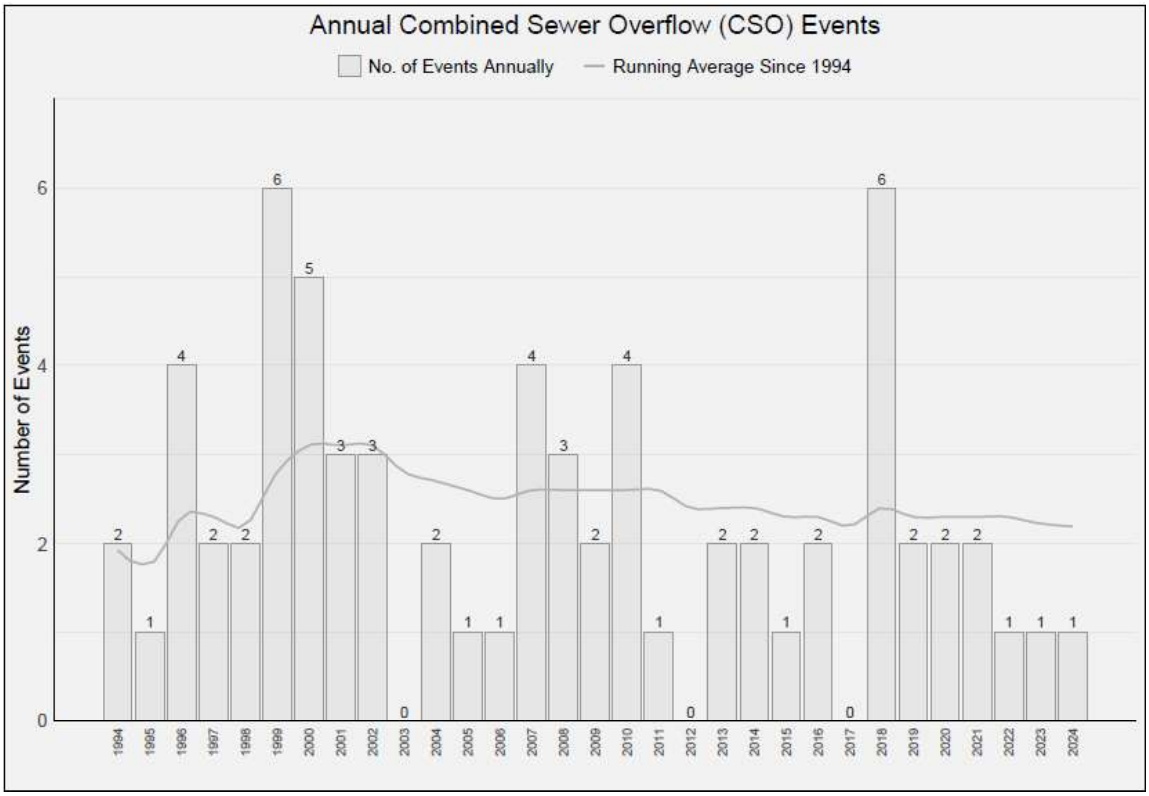

Figure 1

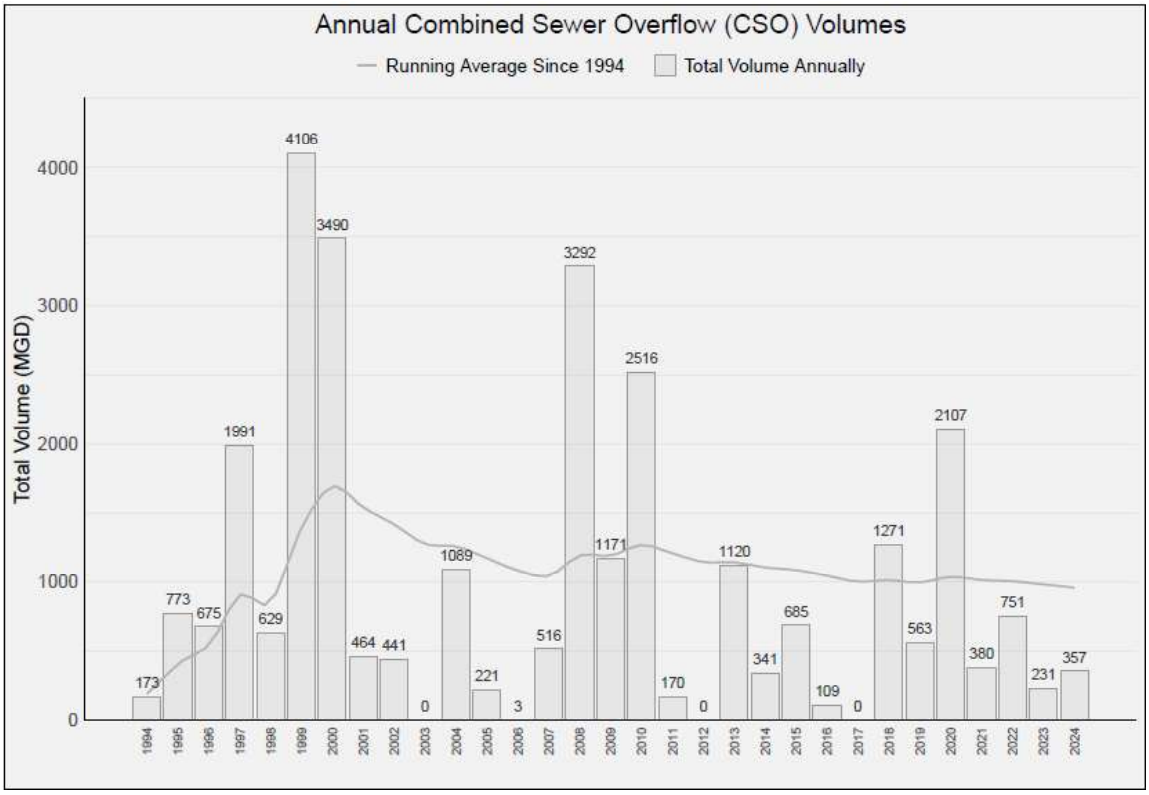

Figure 2

Despite these extensive efforts, CSOs remain the rarely used option of last resort to prevent wastewater from backing up into homes and businesses to protect human health in times of tremendous exertion on the system. The conveyance system has 114 CSO outfalls to Lake Michigan and the Milwaukee, Menomonee, and Kinnickinnic Rivers and their tributaries. Though the District administers a robust industrial pretreatment program, CSOs also contain domestic sewage as well as stormwater that has collected pollutants from urban runoff and animal and yard waste, and data from the last five years indicate that discharges from CSOs will not meet water quality standards. *See Figure 3.*

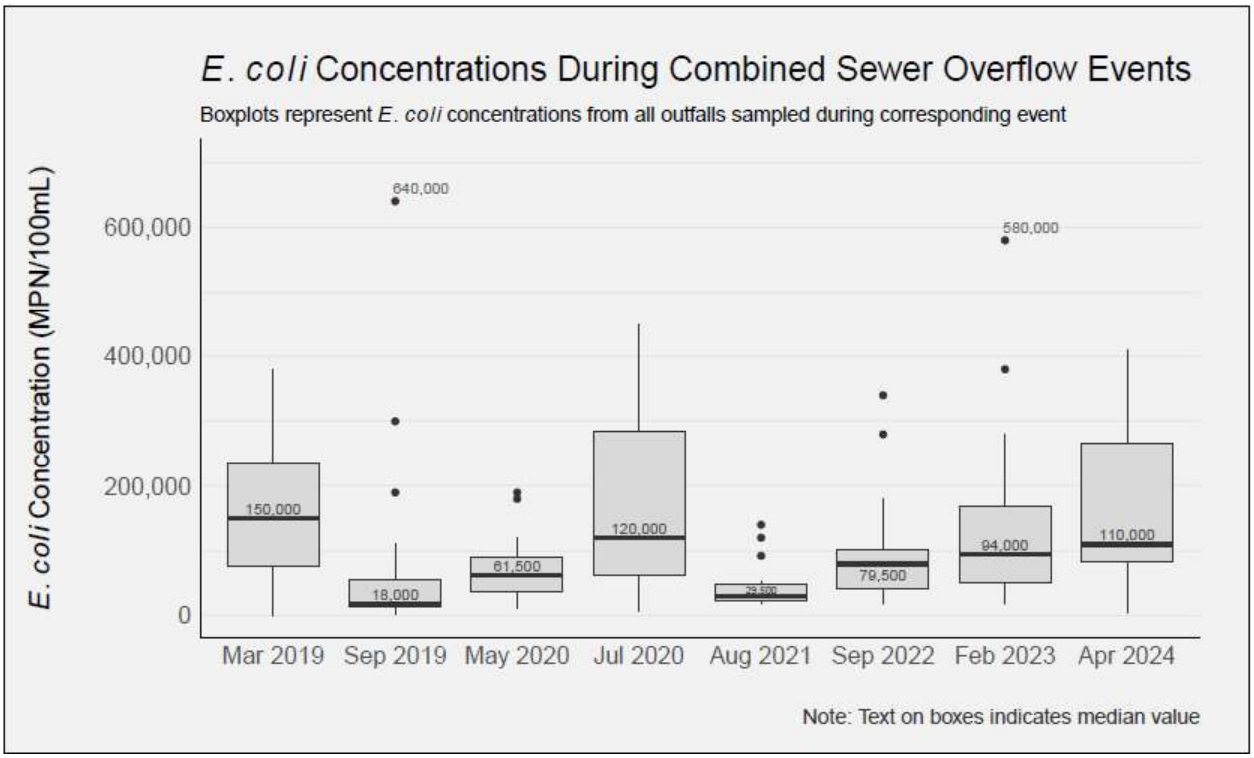

Figure 3

Even with the nine minimum controls implemented, one or two annual CSOs have persisted through the District's previous permit term, and, faced with the reality that climate change is expected to increase the likelihood of extreme rainfall events,[5] CSOs are anticipated to persist into the next permit term as well. Given what is known about the sources of bacteria pollution and the District's commitment to addressing them with an integrated watershed management approach, the District should be granted a variance to realize the greater environmental benefits from controlling other sources of pollution than simply chasing a total elimination of CSOs.

[5] Angel, J., C. Swanston, B.M. Boustead, K.C. Conlon, K.R. Hall, J.L. Jorns, K.E. Kunkel, M.C. Lemos, B. Lofgren, T.A. Ontl, J. Posey, K. Stone, G. Takle, and D. Todey, 2018: Midwest. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 872–940. doi: 10.7930/NCA4.2018.CH21

Nonpoint sources like urban and rural runoff and infiltration carry bacteria into Milwaukee's streams and Lake Michigan. Bacteria from yard and pet wastes are carried in runoff into storm sewers that drain into these waterways. Roads, highways, and bridges transport bacteria the same way or even directly into surface waters. Through infiltration, bacteria enter groundwater, which can connect hydrologically to surface waters used for recreation. Bacteria from wildlife excrement leach or are deposited directly into surface waters. Of these issues, the Southeastern Wisconsin Watersheds Trust Inc. (Sweet Water) determined that

> "Overall, the proportion of runoff containing fecal coliform from urban uses is substantially higher than for other pollutants across all of the watersheds. This fact seems surprising. Not only are sewer discharges not responsible for the fecal coliform loads, but cows are not the biggest source either."[6]

Even if the District ceased all CSO discharges, local waterbodies would still be impaired for bacteria due to these nonpoint sources. The District, however, is committed to combatting nonpoint sources like runoff because it makes social, environmental, and economic sense as a non-CSO control alternative.

Extensive documentation supports the District's framework for wet weather management programming as non-CSO control alternatives that achieve not just greater environmental benefits to the affected water bodies but also protection of the primary contact recreational use and public health through increased control and mitigation of other bacteria sources. Above all, the Regional Water Quality Management Plan (the areawide waste treatment management plan under Section 208 of the Clean Water Act approved by the Wisconsin Department of Natural Resources [DNR] and EPA, hereinafter the "Section 208 Plan"),[7] offers recommendations to maximize environmental benefits by planning at the watershed scale within the region. These recommendations are comprehensive and integrate objectives for land use development, water quality management, and outdoor recreation and open space preservation, among other things.

The Section 208 Plan confirms that the District's previous grey infrastructural capacity improvements have significantly reduced bacteria loadings to area waterways.[8] Further, the Section 208 Plan determined

> "High concentrations of E. coli and the resulting water quality advisories and beach closures have popularly been attributed to overflows from combined and separate

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[6] SOUTHEASTERN WISCONSIN WATERSHEDS TRUST, INC., INSIDE THE GREATER MILWAUKEE WATERSHEDS (2007), https://www.sewrpc.org/SEWRPCFiles/Environment/waterquality/Swwtwater_water_quality_summary.pdf.

[7] A REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE FOR THE GREATER MILWAUKEE WATERSHEDS (Revised May 2013), https://www.sewrpc.org/SEWRPCFiles/Publications/ppr/pr-50_summary_water_quality_2013.PDF.

[8] *Id.* at 107, 148, 153.

> sanitary sewers. Several lines of evidence suggest that while sewer overflows can affect water quality at some of the Lake Michigan beaches, they may not currently be the major factor driving trends in beach water quality."[9]

Other bacteria sources affecting beach water quality include stormwater discharges, runoff from parking lots and other impervious surfaces, waterfowl (especially ring-billed gulls), algae, and beach sand and sediment.[10] The Section 208 Plan recommends a water quality management plan incorporating most actions from the District's 2020 Facilities Plan and adds measures intended to improve water quality by reducing point and urban and rural nonpoint pollution loads. The District's wet weather management programs, to the extent possible within the bounds of its statutory authority, align with the objectives of the Section 208 Plan. Within the overall direction of the Section 208 Plan, the complementary frameworks of the 2013 Regional Green Infrastructure Plan, the 2019 Climate Resilience Plan, the 2035 Vision, and the 2050 Facilities Plan further support the District's variance request.

The District's Regional Green Infrastructure Plan (GI Plan) collected, created, and analyzed extensive data within the District's planning area on impervious surfaces, soils, land use, property ownership, groundwater, topography, separate/combined sewer areas, tree canopy, and other data to determine effective strategies specific to each of the seven watersheds to help the District meet its 2035 Vision goals.[11] The District's green infrastructure program and specific projects are described below. The GI Plan explains not only the environmental case for implementing green infrastructure, but also the often-overlooked advantages of these approaches using a triple-bottom-line analysis of environmental, social, and economic considerations. As detailed in the GI Plan, the District's approach implementing green infrastructure yields the following benefits to residents, municipalities, and the public.

Environmental	**Social**	**Economic**
Green infrastructure reduces about 73,000 tons of carbon dioxide yearly (the emissions of about 14,000 vehicles). Green infrastructure saves 16,500 megawatt hours per year (about $1.5-2.1 million). Green infrastructure reduces about 15 million pounds of total suspended solids, which contains bacteria that can be harmful to human health.	Green infrastructure improves quality of life and aesthetics. Green infrastructure lowers crime rates. Green infrastructure reduces stress by providing calming natural areas and green space. Green infrastructure increases green space with native vegetation and recreational enjoyment.	Green infrastructure saves $44 million in infrastructure costs in the combined sewer area compared to constructing more ISS storage. Green infrastructure develops over 500 green maintenance jobs and 160 construction jobs on average per year. Green infrastructure increases property value by about $667

[9] *Id.* at 185.
[10] *Id.* at 187.
[11] MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, REGIONAL GREEN INFRASTRUCTURE PLAN (2013), https://www.mmsd.com/what-we-do/green-infrastructure/resources/regional-green-infrastructure-plan

		million throughout the District's planning area.

The GI Plan marshals resources within the District's grasp to accomplish its specific objectives, but the plan nests within the broader architecture of the Climate Resilience Plan.

In 2019, the District finalized its Climate Resilience Plan with three broad visions: (1) make the Milwaukee region a better place to live by improving the public's participation in decision making and their environment; (2) boost the region's economic vitality through innovative job creation and access to equal opportunities; and (3) adapt infrastructure to the challenges of the 21st century.[12] These aims set the District on a path to a holistic remedy to the persistence of CSOs by improving the quality of public spaces and services, creating and connecting people to careers supporting greater quality of life and closing the wealth gap, and adapting critical infrastructure to 21st-century environmental challenges to mitigate risks and optimize assets. Climate projects anticipate seasonal impacts on the region, including more winter precipitation as rain than snow in winter and more frequent large rainstorms in spring and autumn. The Climate Resilience Plan identifies 20 actions, a lead actor (municipal, non-profit/business, or District), constraints, and implementation tactics to achieve the desired outcomes. This plan embraces high-level issues that help address water quality concerns related to CSOs, from accelerating local efforts to improve communities by replacing grey impervious surfaces with green spaces, to developing entrepreneurship opportunities with direct links to water and energy technologies for future job needs, to increasing green infrastructure in the region. In line with these high-level concerns, the District has set goals to animate the next decade of its operations.

For the next ten years, the 2035 Vision[13] propels the District toward achieving two strategic objectives: integrated watershed management and climate change mitigation/adaptation emphasizing energy efficiency. Integrated watershed management is an approach calibrated to the watershed level and founded on the cooperation of grey and green infrastructure[14] responsive to inter-jurisdictional conditions. Management at this scale more efficiently addresses water quality issues by aligning with natural hydrological systems and boundaries. As mentioned, the District will also be on the front line in responding to climate change as warmer and wetter conditions are expected for the region. The 2035 Vision calls for exactly the approach bolstered by Factor 3 that the energy-efficient integrated watershed management responsive to climate change achieves greater environmental, social, and economic benefits while avoiding the disruptive and damaging effects a grey infrastructure path to zero CSOs would yield. Closing the gap from one CSO yearly to none potentially could be accomplished by significant capacity

[12] MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, RESILIENCE PLAN (2019), https://www.mmsd.com/application/files/7015/6719/9307/Resilience_Plan_2019_FINALv2.pdf
[13] The Milwaukee Metropolitan Sewerage District's 2035 Vision and Strategic Objectives (Revised Dec. 16, 2010), https://www.mmsd.com/about-us/2035-vision
[14] 33 U.S.C. § 1362(27).

improvements to the District's existing pipeline conveyance system. Such improvements, even if feasible, would require significant disruption to the community and environment. Upsizing District sewer pipes in most instances to increase capacity sufficient to avert remaining CSOs is not practical and would require disruption to the environment for access, heavy machinery and carbon emissions, and more intensive future maintenance. Instead, the District is planning the future of its facilities to more wisely respond to the threat of continued CSOs by integrating tactics.

The District has made monumental progress in reducing CSOs, and, while potential remaining CSOs may affect water quality, eliminating them in the near-term is impractical and, likely, infeasible. As documented in the District's 2050 Facilities Plan's[15] consideration of CSO-elimination alternatives, "if MMSD commits to eliminating all CSOs, the cost is in the billions of dollars, regardless of the alternative."[16] Further, the evaluated alternative that would maximize tunnel volume for storage admittedly only creates a static system unresponsive to back-to-back extreme events—conditions which could still produce CSOs.[17] In light of an anticipated warmer and wetter climate, it would be unwise to devote public expenditures to such narrowly tailored solutions, which, to implement, require environmental disruption, greenhouse gas-emitting heavy machinery, and energy-intensive rehabilitation and maintenance. In fact, the 2050 Facilities Plan acknowledges,

> "Because increased flows are projected under Conveyance Future and Buildout Conditions, it is anticipated that these targets will be even more difficult to achieve even if recommended projects are implemented for the Conveyance and Storage and WRFs and Biosolids Asset Systems. Achieving zero overflows is predicted to be very expensive, as described in this analysis. Therefore, this analysis is intended to be a roadmap for a phased approach; by developing full-scale alternatives that incorporate treatment and storage options, the most feasible incremental phases can be identified. The base alternative for this analysis assumes that applicable recommended Conveyance, WRF and Green Infrastructure (GI) projects will be implemented as the important first step toward achieving zero overflows."[18]

The District will continue taking an integrated watershed management approach to improving water quality that prioritizes such green infrastructure and other projects outlined below that provide greater and faster environmental and public health benefits while remaining committed to targeted, effective traditional capacity improvement projects.

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[15] THE MILWAUKEE METROPOLITAN SEWERAGE DISTRICT 2050 FACILITIES PLAN, https://www.mmsd.com/government-business/2050-facilities-plan

[16] *Id.*, Appendix 6E p. 42.

[17] *Id.*, Appendix 6E, Table 6E-14 p. 44.

[18] 2050 FACILITIES PLAN, *supra*, Appendix 6E, p. 26.

Though the WQS may be unattainable during CSOs within the permit term, incremental water quality progress can be achieved. It is within the context of these guiding frameworks that the District's wet weather management programs that follow should be considered as achieving greater environmental benefits in local water quality than simply eliminating CSOs. These programs are all voluntarily planned, designed, and undertaken by the District and not otherwise required. They will be implemented, a commitment demonstrated by the adoption of the 2025 budget by the District's governing body. More information about these projects can be found in the 2025 budget and online at the District's website.[19] For the term of the reissued WPDES permit, the District proposes its commitment to its goals in carrying out the wet weather management programs outlined below as non-CSO control alternatives in satisfaction of the variance requirements.[20]

Watercourse Projects. The District has discretionary authority to modify watercourses within its jurisdiction to reduce flood risks and considers climate change in these watershed-level efforts.[21] Watercourse projects during the next permit term will address waterbodies affected directly by CSOs.[22] The projects anticipated for this timeframe are at various phases from preliminary engineering to construction and in most cases entail the removal of concrete channel lining and re-naturalizing the stream. These restoration projects slow the pace of ordinary river flow and floodwaters, thereby reducing the volume of CSOs and the incidence of SSOs. The restored natural channel filtration features hold back bacteria while also markedly improving riparian aesthetics, habitat, and safety—environmental, social, and economic benefits foregone if the District allotted its resources only to capacity improvements for CSO elimination.

In the next permit term, the District is committed to its goals of completing:

- Preliminary engineering of:
    - Menomonee River projects: Underwood Creek Reach 2, Honey Creek Reach 4;
    - Kinnickinnic River projects: KK River I-94 to Becher, Wilson Park Creek;
- Design of:
    - Menomonee River projects: Honey Creek Reach 1 Concrete Removal;
    - Kinnickinnic River projects: KK River 6th-16th St., 43rd St. Ditch, Lyons Park Creek Channel Stabilization Phase 2;
- Construction of:

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[19] THE MILWAUKEE METROPOLITAN SEWERAGE DISTRICT, 2025 OPERATIONS AND MAINTENANCE & CAPITAL BUDGET, available at https://www.mmsd.com/application/files/4417/3438/5949/2025BudgetCombinedWEB.pdf; www.mmsd.com.

[20] *See* Wis. Admin. Code Ch. 200 Subch. III and 40 C.F.R. § 131.14.

[21] MMSD Commission Policy 1-01.15, "Flood Risk Reduction Policy," effective as of 04/27/2020.

[22] The District operates one CSO outfall (CSO 196) in the proximity of a direct-contact recreational beach in South Shore Park along Lake Michigan. During the recreational season (May 1 to October 1), operators put the system in manual mode to discharge through CSO 196 only when necessary, balancing the competing risks of harming human health in basement backups and those associated with overflows.

- Menomonee River projects: Western Milwaukee Phase 2B, County Grounds Basins Wildlife Enhancements;
- Milwaukee River projects: 30th Street Corridor Wet Weather Relief West Basin;
- Kinnickinnic River projects: Jackson Park, and Lyons Park Creek Channel Stabilization Phase 2.

These projects are substantial and require the coordinated efforts of the District as well as private and municipal partners and state and federal regulators. The logistics and, ultimately, success of these projects depends upon efficient cooperation, and the District remains committed to collaborating to bring these projects to fruition acknowledging it does not have unilateral control.

Green Infrastructure. In unison with the 2035 Vision, the District has planned and is executing projects to meet the goals of its Regional Green Infrastructure Plan.[23] Through its Fresh Coast programming, the District will continue ramping up green infrastructure implementation across the service area. The District helps local schools use green infrastructure to transform their schoolyards to manage stormwater, provide outdoor and educational opportunities, and serve as community space. Several Green Highway projects are underway, which devise and analyze green infrastructure alternatives for construction on land below overpasses. As mentioned, roadway runoff is a considerable source of bacteria loadings to surface water, so these projects are intended to interrupt the flow of pollutants in addition to mitigating unsafe flood conditions. During the term of the next permit, the District plans to capture 50 million gallons of stormwater with green infrastructure.

Public Education and Outreach. The District also invites the public to participate in water quality improvement measures by issuing Water Drop Alerts™[24] and engaging with the community through the WaterMarks public art collaboration.[25] Water Drop Alerts help reduce pollution from CSOs by notifying the public by text message to use less water when large storms and heavy rains threaten the area. WaterMarkers, 30-foot poles supporting an illuminated letter representative of the community and one component of the WaterMarks initiative, pulse during Water Drop Alerts, further amplifying the message to reduce water, in addition to serving as a landmark for other elements of community engagement and togetherness. When people reduce their water usage during wet weather, the risk of CSOs and bacteria pollution in local waterways is diminished, preserving water quality. During this permit term, the District will continue issuing Water Drop Alerts. Presently, the District owns one WaterMarker incorporated as part of its Pulaski Park project that removed over 1,700 feet of cracked and broken concrete river lining and restored the Kinnickinnic River to a natural stream.[26] For the term of the next permit, the

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[23] REGIONAL GREEN INFRASTRUCTURE PLAN, *supra*.
[24] The Milwaukee Metropolitan Sewerage District, WATER DROP ALERT™, https://www.mmsd.com/what-you-can-do/water-drop-alert.
[25] Watermarks, https://www.watermarksmke.org/.
[26] The Milwaukee Metropolitan Sewerage District, PULASKI PARK, https://www.mmsd.com/what-we-do/flood-management/kinnickinnic-river/pulaski-park.

District's goal is to own and operate one additional WaterMarker each at its 30th St. West Basin site and at its headquarters facility. This is a coordinated, community-wide initiative, and other local governments and organizations are installing additional WaterMarkers around the region to maximize public participation and effectiveness.

Infiltration and Inflow Reduction. The District combats sources of infiltration on large and small scales by rehabilitating not only its own sewer segments but also working with private property owners to disconnect foundation drains and to line leaky laterals. These remedies help homeowners avoid inconvenient and potentially harmful basement water issues but also keep clear water out of the sewerage system, reserving capacity that, in turn, can avert CSOs. The District's goal for this permit term is to remove at least 7 million gallons (MG) per year from entering the system.

Reforestation and Wetland Restoration. In the term of the previous permit, the District started its own dedicated reforestation and wetland restoration (RWR) program to implement large-scale flood management replicating natural hydrologic processes. In addition to keeping clear water out of the combined sewer system and reducing CSOs, by curtailing runoff, trees prevent bacteria from being carried into surface waters.[27] The federal Department of Transportation determined that "Properly designed wetland systems are extremely effective at removing soluble pollutants and particulates from ultra-urban stormwater runoff."[28] This program combines these forms of decentralized green infrastructure to "[leverage] the capabilities of soil and vegetation to infiltrate, redistribute, and otherwise store stormwater volume, with the potential to realize ancillary environmental, social, and economic benefits."[29] The program's goals for the term of the next permit are to plant 2 million trees and restore 1,300 acres of wetlands.

Land Protection. The District's efforts in land protection are some of the non-CSO alternatives that, as investments, yield the greatest dividends in capture and storage with added environmental benefits, thanks to the magnitude of the projects. Under the Greenseams® program, the District purchases and restores lands with water-absorbing hydric soils, which in turn protects natural wetlands, riparian corridors, and wooded properties as a cost-effective way of keeping water on the land where it falls and preventing pollutants from being carried off in stormwater into waterways. To date, the District has permanently protected 151 properties, restored over 5,000 acres of land, planted over 118,000 trees, and stored over 3 billion gallons.

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[27] United States Environmental Protection Agency, Soak Up the Rain: Trees Help Reduce Runoff, https://www.epa.gov/soakuptherain (select "Trees").

[28] United States Department of Transportation Federal Highway Administration, Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring, https://www.environment.fhwa.dot.gov/env_topics/topics_home.aspx (search "stormwater best management").

[29] Berland A, Shiflett SA, Shuster WD, Garmestani AS, Goddard HC, Herrmann DL, Hopton ME. The role of trees in urban stormwater management. Landsc Urban Plan. 2017 Jun;162:167-177. doi: 10.1016/j.landurbplan.2017.02.017. PMID: 30220756; PMCID: PMC6134866, available at https://pmc.ncbi.nlm.nih.gov/articles/PMC6134866/.

With Working Soils®, the District obtains voluntary permanent easements on undeveloped private, formerly agricultural properties along streams, hydric soils, and wetlands in areas expected to have major growth in the next 20 years. The District's goals for these programs for the permit term are to add 10,000 acres and to sequester 30% of the District's carbon footprint.

Rules Enforcement. As a regulator of tributary municipal sewerage systems, the District uses its statutory authority to address water quality issues before they enter the system. First, the District's Rules require that governmental units within the service area adopt an inflow prevention ordinance.[30] The Rules also authorize the District, upon a finding of an exceedance of peak hourly flow rate for a sanitary metershed, to require the municipality to develop and implement a peak hourly flow rate reduction program. [31] Finally, District Rules require stormwater runoff management of the volume, timing, and peak flow rate of runoff from locally approved development or redevelopment prioritized by preservation of natural features over new quantity control construction.[32] Enforcement of these rules will reduce inflow and infiltration in tributary sewer systems, reducing the risk of CSOs. The District will continue vigilantly monitoring and enforcing these provisions of the Rules during the next permit term.

With so many variables and unknowns, it is impossible to predict the number or volume of CSOs in the next permit term and exceedingly difficult to foresee resulting bacteria counts. The District immediately commits to continuing to operate and maintain the ISS to achieve, in any given year, either six or fewer CSOs or the total collection and conveyance of combined stormwater and wastewater to the treatment plants of 85% or more of the combined sewage collected as the result of precipitation events as outlined in the previous permit at section 4.3.4. The District also proposes to continue its efforts to reduce CSOs in occurrence and volume by implementing the above-described wet weather management programs as non-CSO alternatives. Included below is an updated version of the District's proposal to manage wet weather to help in the elimination of CSOs.

[30] MMSD Rules § 3.107.
[31] *Id.* Chapter 3, Subchapter II.
[32] *Id.* at 13.302.

4.3.4.3 Water Quality-Based Requirements – Wet Weather Management

To meet the CSO performance standards in section X.X to reduce the duration, frequency, and magnitude of the overflows and to reduce the adverse effects of overflows, the permittee shall implement wet weather management programs, such as the programs identified in the following table. To document implementation of the programs required by this section, the Permittee shall submit reports as required by sec. X.X.

Wet Weather Management Programs	
Program Description	**Goal**
Reduce the volume and peak flow rate of runoff entering the sewerage system.	• Fund green infrastructure implementation on public and private land. • Support green infrastructure maintenance. • Implement and enforce runoff management requirements, according to MMSD Rules, Chapter 13. • Participate in public education and outreach to help the public reduce usage during heavy strain on the sewerage system. Install and operate public notification systems including two WaterMarkers and ongoing Water Drop Alerts as appropriate.
Reduce inflow related to flooding by reducing the number of structures in the regional floodplain.	• Undertake watercourse projects that include channel reconstruction and removal of structures from the floodplain. • To the extent possible with partner cooperation, complete preliminary engineering of Underwood Creek Reach 2, Honey Creek Reach 4, KK River I-94 to Becher, and Wilson Park Creek.To the extent possible with partner cooperation, complete design of Honey Creek Reach 1 Concrete Removal, KK River 6th-16th St., 43rd St. Ditch, and Lyons Park Creek Channel Stabilization Phase 2. • To the extent possible with partner cooperation, complete construction of Western Milwaukee Phase 2B, County Grounds Basins Wildlife Enhancements, 30th St. Corridor Wet Weather Relief West Basin, Jackson Park, and Lyons Park Creek Channel Stabilization Phase 2. • Consider climate change when preparing and implementing Watercourse Management Plans. • Protect or restore riparian land with hydric soils and wetlands.
Reduce inflow and infiltration in tributary sewerage systems	• Fund private property infiltration and inflow reduction programs with the goal of removing at least 7 million gallons from the system annually by the end of the permit term. • Implement and enforce the roof drain disconnection requirements of MMSD Rules, sec. 3.118. • Implement and enforce wet weather peak flow management requirements for tributary metersheds, according to MMSD Rules, secs. 3.201 and 3.202.
Reduce non-point pollutant loadings into area waterways	• Acquire riparian buffers and provide treatment using green infrastructure. • Support the implementation of agricultural practices that reduce pollutants in runoff. • Protect 10,000 acres through GreenSeams and Working Soils.

	• Continue to design and implement the Burnham Canal Wetlands Project which will ultimately use wetlands to treat CSO discharges to Burnham Canal, if they occur. • Collaborate with tributary municipalities to implement projects necessary to achieve total maximum daily loads. • Reduce pollutant loads to watercourses by implementing, where appropriate, reforestation or wetland restoration projects upstream of District watercourse projects. • Plant 2 million trees and restore 1,300 acres of wetlands.
Improve aquatic habitat to increase the number and diversity of species	• Undertake watercourse projects that include channel reconstruction and removal of structures from the floodplain. • Implement the recommendations of the Urban Biodiversity Plan, as approved by the Department as part of the 2050 Facilities Plan, when implementing green infrastructure and watercourse projects and when restoring riparian buffers. • Support federal and state priority projects for reducing beneficial use impairments in the Milwaukee Estuary Area of Concern, such as the Dredged Material Management Facility.

4.3.4.3.1 Green Infrastructure Detention Capacity

The permittee shall facilitate the implementation of green infrastructure detention capacity in watersheds within or tributary to the permittee's service area. For the total green infrastructure detention capacity to be achieved during the term of this permit, the goal is at least 30 million gallons. The Permittee shall implement green infrastructure in the combined sewer area to the maximum extent practical.

The permittee shall determine detention capacity using the following procedures:

1. Project-specific modeling;
2. The detention capacity calculating tool available from the Permittee; or
3. The following table;

Green Infrastructure Practices	Unit Detention Capacity
Bioswales	7.5 gallons/square foot
Cisterns/Rain Barrels	1 gallon/gallon
Constructed Wetlands	8.3 gallons/square foot
Floodplain Structure Removal	5,000 gallons/structure
Green Alley or Street	6.2 gallons/square foot
Green Roofs	1 gallons/square foot
Native Landscaping	0.4 gallons/square foot
Porous Pavement	3 gallons/square foot
Rain Gardens	4.4 gallons/square foot
Soil Amendments	0.2 gallons/square foot
Stormwater Trees	25 gallons/tree
Preservation of hydric soils or non-hydric soils with native landscaping	1.5 gallons/square foot
Other Practices	As determined by the District and accepted by the Department

The permittee shall count green infrastructure towards the detention capacity goals when construction is complete. Any green infrastructure practices/control measures that are put in place to fulfill the detention capacity goals must be maintained during the term of this permit.